JUSTIFICATION OF INVESTMENTS INTO NUCLEAR POWER STATION
CONSTRUCTION IN THE REPUBLIC OF BELARUS

BOOK 11

EVALUATION OF IMPACT ON THE ENVIRONMENT
1588-ПЗ-ОИ4
PART 8
EIE REPORT
(Edition of 06.07.2010)
ANNEX

2010
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1 GENERAL PROVISIONS

1.1. Description for impact assessment procedure for preliminary and project documentation design

Environmental Impact Assessment (EIA) for planned and other activity—activity, accomplished at the stage of preliminary design and project documentation implementation and directed to determine the types of Environmental Impact as a result of planned activity fulfillment, as well as to determine Environmental relevant changes and to forecast environment its state. EIA procedure ensure that public opinion and information on EIA will be submitted to authorized bodies (Ministry of natural resources & environmental protection of the Republic of Belarus) before decision-making on feasibility for planned activity implementation and permission to start designing.

Impact assessment procedure shall be done according to drawing scheme P.1
EIA procedure is set out in the Article 4 «Instruction on procedure for Environmental Impact Assessment by planned economic and other activity in the Republic of...»

**Drawing scheme P.1 – Impact estimating scheme**

EIA procedure is set out in the Article 4 «Instruction on procedure for Environmental Impact Assessment by planned economic and other activity in the Republic of...»
Belarus, hereafter referred to as Instruction adopted by Regulation of Ministry of Natural Resources of 17.06.2005 № 30 and consists of five stages (drawing scheme P.2)

**Stage 1**
- preparation of request on intention
- 23.03.2009
- technical assignment preparation
- understood by the letter of Ministry of Natural Resources of 17/03/2009 N 14-15/1337-BH

**Stage 2**
- determination of type and impact value
- their after-effect forecasting

**Stage 3**
- application making on potential environmental impact

**Stage 4**
- holding of public hearings
- Ostrovez, Grodno region 9.10.2009, 813 people participated

**Stage 5**

Drawing P.2 - General scheme of EIA procedure

1.2 EIA report preparation

EIA report made by EIA development engineer on the base of requirements of Instruction Article 7, Addition II Espoo Convention and technical assignment adopted with letter of Vice-chief Minister of natural resources and environment protection of the Republic of Belarus of 17.03.2009r N 14-15/1337-BH. All the points specified in that documents are examined in EIA report for Belorussian APS.

EIA report preparation procedure is presented in drawing scheme P. 3.
RUP “BelNIPIEnergoprom” develops EIAP on the base of technical assignment adopted by RB Ministry of Natural Resources of 17.03.2009r N 14-15/1337-BH.

RB Ministry of Energy makes public the EIAP report

RUP “BelNIPIEnergoprom” subject to reasoned public proposals notify Ministry of Natural Resources the adjusted EIAP report

RUP “BelNIPIEnergoprom” shall add or amend the report and resubmit it to EIAP actors

RUP “BelNIPIEnergoprom” report to State Environmental Expertiza on EIAP, consultation protocols with EIAP actors and reasoned estimation of interested general public

EIAP actors subject to reasoned public proposals notify Ministry of Natural Resources the adjusted EIAP report

EIAP actors are authorized to render to EIAP development engineer the reasoned requirements for accounting in EIAP report

EIAP actors shall analyze the report and render their reasoned conclusions on EIAP report

RUP “BelNIPIEnergoprom” shall add and amend the EIAP report and resubmit it

The Ministry of Natural Resources having analyzed the EIAP report, conclusions of actors and reasoned proposal estimation of general public shall lead project Environmental Expertise. Positive decision N 28 of 13 July 2010

The Ministry of Natural Resources renders reasoned proposals to add or amend the EIAP report. It may require the report reintroduction to general public in the context of its essential amendment

All actors within EIAP procedure are authorized to apply to the Ministry of Natural Resources in writing to present information on potential violations

Drawing scheme P. 3 – EIA report preparation procedure
EIA actors consider the EIA report within 30 calendar days starting with its entrance and send it to the Ministry of Natural Resources their comments and proposals. EIA actors may provide reasoned requirements to update and amend the report by design developer of impact environment assessment documents. The developer of EIA data shall update or correct and resubmit it to EIA actors. After comprehensive analysis, the EIA report updated in accordance with public discussions on the territory of the Republic of Belarus, public discussions and consultation on the territory of parties concerned is submitted for State Environmental Expertise as part of design documents. The volume of documents attached is stipulated in Paragraph 22 «Regulation on impact environment assessment» adopted by Resolution of Cabinet Council of the Republic of Belarus of 19.05.2010 N 755, hereinafter referred as Resolution.

The Ministry of natural resources may require organizing the report resubmission to general public when after remarks and proposals account the EIA report has been essentially changed, corrected or updated (for example has been presented new sites, technological alternatives, mitigation of environmental impact measures etc).

All the actors of EIA development procedure may readdress to the Ministry of Natural Resources and EIA actors on the questions in their sphere until Ministry of Natural Resources make the decision. In their appeal the actors shall present in writing the information on potential disturbance during determination, specification and assessment for possible environmental impact as result of planned activity.

1.3 Public discussion procedure

Public discussion (hearing) procedure is set out in the Article 6 of the Instruction and Article 3 of the Provision and is underway:
- to inform general public on the subject concerned environment protection;
- to implement public rights for participation in discussion and making of ecologically significant decisions;
- to account remarks and proposals of the public concerning environment protection, during impact assessments process and decisions making related to planned activity realisation;
- to find mutually acceptable, for customer and public, decisions related to prevention or minimization of environmental hazard during planned action implementation;
- to establish recommendations for further design and realization stages of planned activity design option.

Public participation in EIA procedure allows:
- to obtain valuable information on local terms from local community;
- to determine important questions or problems indicating EIA volume;
- to obtain project additional alternative, suggested by local community;
- to avoid potential further conflicts;
- to guarantee transparency and objectiveness for the whole EIA process and making decisions on EIA.
Public discussion procedure includes several stages (drawing scheme P.4)

<table>
<thead>
<tr>
<th>Public notification on public hearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing of access of public to EIAP report by customer and (or) local executive and regulatory bodies, bibliothecas and other available places as well as if possible – EIAP report placing in the global computer network Internet</td>
</tr>
<tr>
<td>Making aware of public with materials of EIAP</td>
</tr>
<tr>
<td>Consideration of notification on possible environment impact and materials of influence estimation with public (actually public hearings)</td>
</tr>
<tr>
<td>Drawing up of the report for public hearing with schedule of the comments and proposals list received from the public during hearing with a substantiation of their acceptance or deviation</td>
</tr>
</tbody>
</table>

### Drawing scheme P.4 – Public discussion (hearing) procedure

Information on public discussion brought to the notice of the public through mass media in accordance with the Article 6 «Instruction on procedure of environment impact assessment of planned activity in the Republic of Belarus» adopted by the Ministry of Natural Resources and environmental protection of the Republic of Belarus of 17 June 2005 N 30:


Public access to preliminary EIA report was provided in GU «DSAE», Minsk, and info centre GU «DSAE», Ostrovez.

178 labour collectives, public organization participated in EIA report discussion procedure till 09.10.2009: Belorussian Green Party, Group «Ecoprotection», Movement «Scientists for denuclearized Belarus», OO «Ecohaus» and 42 individuals. During discussions it has been asked about 800 questions. Records repository received by the Ministry of Energy, Ministry of Natural Resources, GU «DSAE», RUP “Belnipienergoprom” is in possession of GU «DSAE». The general results of public discussions of impact environmental estimation of the APS in labour collectives and public organisations of the Republic of Belarus in October 2009 (letter GU «DSAE» of 02.11.09 N 09/1224) are given in the Table P.1.
### Scheme П.1 – Results of public discussion of NPS impact environmental assessment in labour collectives and public organization of the Republic of Belarus

<table>
<thead>
<tr>
<th>Region</th>
<th>Meetings in labour collectives</th>
<th>Meetings in public organization</th>
<th>Participated</th>
<th>Took a vote on</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>For</td>
</tr>
<tr>
<td>Minsk</td>
<td>805</td>
<td>13</td>
<td>116 908</td>
<td>74 332</td>
</tr>
<tr>
<td>Minsk region</td>
<td>10</td>
<td>-</td>
<td>857</td>
<td>747</td>
</tr>
<tr>
<td>Mogilev region</td>
<td>259</td>
<td>24</td>
<td>5 440</td>
<td>5 287</td>
</tr>
<tr>
<td>Gomel region</td>
<td>173</td>
<td>18</td>
<td>18 306</td>
<td>13 595</td>
</tr>
<tr>
<td>Brest region</td>
<td>53</td>
<td>9</td>
<td>7 774</td>
<td>6 876</td>
</tr>
<tr>
<td>Vitebsk region</td>
<td>160</td>
<td>5</td>
<td>12 567</td>
<td>12 337</td>
</tr>
<tr>
<td>Grodno region</td>
<td>213</td>
<td>3</td>
<td>20 818</td>
<td>14 651</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1 673</strong></td>
<td><strong>72</strong></td>
<td><strong>182 670</strong></td>
<td><strong>127 825</strong></td>
</tr>
</tbody>
</table>
Public hearings took place on 9 October 2009 from 10.00 to 17.30 in civic hall «Ostrovez» at address Grodno region, Ostrovez, Oktyabrskaya str. 3 with agenda – «Data consideration of preliminary report on Environmental Impact Assessment (hereinafter EIA) of construction activity and exploitation of atomic power station in the Republic of Belarus».

State institution «Directorate of nuclear station construction» under the auspices of Grodno regional executive committee and Ostrovez district executive committee was the organizer of public hearings.

Hearings (discussions) took place on the base of Order of Minister of energy of the Republic of Belarus of 23.09.2009 № 196 «On carrying out of the preliminary report discussions on Environmental Impact Assessment of Belorussian APS».

813 people took place in hearings (discussions).

Public hearing minutes is presented in paragraph 8.4 of EIA for Belorussian APS, replies to answers are discussed in paragraph 11 of EIA.

1.4 Public information

In paragraph 2 of Committee Conclusion on estimation of development feasibility in the Republic of Belarus of nuclear power, established by Regulation of the Prime Minister of the Republic of Belarus of 31 Mart 1998 N 88п, was stated: «Within the next 10 years it is inexpedient to start nuclear station construction, but it is necessary to continue works on preparation for atomic engineering development in Belarus in the future».

In July, 2008 the Orhussky centre made certain work which goal was to work out fair presentation for public informing on occurring processes in the field of atomic engineering development in republic. This work was made after citizens have started to address with questions on this theme to the Orhussky centre and on a "hot" line of Ministry of Natural Resources.

One of the basic traditional sources of the information for the republic population are printed mass media, besides, all of them have the electronic versions on Internet pages. Therefore it has been decided to analyse all the publications in the central republican printed mass-media on the topic of atomic energy industry development in the Republic of Belarus. Search depth has made 10 years. 5 republican printing mass-media and other sources have been chosen. In the context of the long search depth this work was very labour-consuming and has been made by the Orhussky centre with attraction of volunteers.

As a result of the made mass-media analysis, was made the conclusion that the public of the Republic has been enough informed on intention to develop atomic energy industry in Republic. Some of the published materials had purely information character, some propaganda; some presented various opinions on this question, including the extremely negative.

The basic conclusion which can be made as a result of the made analysis, is that any citizen interested in questions of atomic energy industry development in the Republic of Belarus, had ability to make an integral picture of occurring processes.

The article «In particles order is strength of whole» may be given as an example of such publication published on October, 12th, 2007 in the newspaper «Soviet Belarus» and in which in particular was stated: «The basic decision on APS construction, I will remind, was adopted at conference at the President in December last year. Since that moment the country has considerably promoted on a way to "atom". Station construction is set out in two major documents - the Directive N 3 and Concepts of power safety of Belarus. Urgency was added to the work (which, by the way, was made in our country since 1992) for optimum site selection for object construction. The potential contrac-
tor was determined… Nevertheless, it is early to tell that there is already full clearness in all questions of creation of nuclear station. The purpose of yesterday’s working meeting at the President was to bring in this question more clearness.

But before starting conversation directly about the APS, Alexander Lukashenko concentrated attention to a problem of power independence on the whole. President pointed out that the nuclear power station construction unfortunately cannot solve this problem entirely. Because nuclear fuel, as well as oil, and gas, shall be imported. Therefore by no means it’s impossible to refuse now projects on use of local sources: fire wood, peat, combustible slates, brown coals, and also energy of the rivers, geothermal sources and, probably, a wind...

The institute for sociology NAS of Belarus made research work «Studying of public opinion on problem of nuclear power and working out of recommendations on increase of degree of belief of the population to APS construction in the Republic of Belarus» in 2008.

According to results of researches it could be said, that there were quality changes population attitude towards own nuclear power development:
- the number of supporters of the given way - from 28,3% in 2005 to 54,8 % in 2008 grew almost twice;
- 2/3 of respondents expressed confidence, that the situation in a fuel and energy complex of the country will considerably improve with APS construction as well as competitiveness of the Belarus goods and services will rise;
- 75, 5% offered to support the APS construction in case adherence of safety conditions, competitive selection and international design expertise.

There are serious problems in information support of atomic power development and APS construction. Interrogation has shown, that:
- 36, 7 % consider that today they know more about the threats and risks concerned nuclear power, than about its advantages;
- 56, 6 % consider, that the information on the given theme exists, but it is very poor;
- 10, 6 % consider that there is enough information.

The earlier noted effect called «information scissors», when people watch and read one thing, and trust to another, is remaining. Experts and scientists enjoy the greatest confidence, but their representation in mass-media, as the basic source of the information, mismatches interest of respondents to the given problem.

The country public considers being necessary and actively supports an adoption of the Law of the Republic of Belarus «On atomic energy use». According to respondents opinion, a number of guarantees - ecological safety, personal safety of people living near to the atomic power station, protection against possible acts of terrorism should be established in the Law, as well as norms of the criminal liability for infringement of service regulations of the atomic power station are defined.

Thus, the results of research show the following:
- Public opinion quite realistic shows ability of diversification for power resources delivery, exception of dependence on import in the foreseeable future, prospectively of different type of sources.
- Public mind is quite conscience barometer, it responds adequately enough to working condition changes of the branch first of all connected with complexities of delivery and energy sources payment.
- Commonwealth actively support innovation search in the sphere of energy efficiency, resources saving, reduction of power capacity of Belorussian goods and services, first of all development of new technology for local and alternative sources usage for the purpose of improvement of energy preparedness and energy independence of the country.
The attitude of the population to nuclear power, construction of own APS is characterised by positive quality changes for last years. Mainly, emotional feeling with appreciable scent of a Chernobyl syndrome is being replaced by the quiet, rational approach considering imperatives of the developed situation on the one hand, and world tendencies and experience of other countries in this sphere - on another. Citizens of the country understand more and more, that the Postchernobyl dilemma «Either radiating safety or the APS» is false, and, in this base, increasingly express support to construction of own atomic station. The considerable part of the population expresses readiness to invest in this project, and also agree, where they meet the certain conditions of safety, to work on the APS and to live near to station. Nevertheless, about 25 % of respondents did not find their position on the given question (answers «I am at a loss to answer»); many respondents have contradictory assessment and positional diffusion (the deliquescence of beliefs). To a considerable extent it is related to, that the supply of population with information on the given problem, for the present, lags behind interests of people and a real course of events in the given sphere.

1.5 Summary

From the given section follows, that one of the EIA procedure sentencing is to involve public in discussion and decision-making on the questions defining development of the Republic of Belarus. Normative documents, participants of EIA procedure and etc are documented in this section. Summarized information on EIA procedure is described on drawing P.5.
Drawing P. 5 – Summarized information on EIA procedure

The decision of State Environmental Expertise is issued according to result of EIA procedure. The decision in question together with supporting materials of investment «Belorussian Atomic Power Station» is sent to expertise to RUP “Glavstroyekspertiza”. According to results of submitted data consideration, «Glavstroyekspertiza» shall recommend the investment consideration «Belorussian Atomic Power Station» to the approval as indicated in the Conclusion of 14.07.2010 N 41-17/10.

2 ASSESSMENT OF IMPACT OF BELORUSSIAN APS IN TRANSBOUNDARY CONTEXT

2.1 General provisions

The following countries: the Russian Federation, Ukraine, the Austrian Republic, the Lithuanian Republic, Republic Latvia, Republic Poland have expressed desire to participate in impact assessment procedure.

The list of events held with interested parties within the limits of execution of the Convention on environmental impact assessment in a transboundary context is specified in the Table P.2.

**Table P.2 – list of events with interested parties**

<table>
<thead>
<tr>
<th>№ п/п</th>
<th>State title</th>
<th>Date and place of public hearing</th>
<th>Date and place of consultation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lithuanian Republic</td>
<td>02.03.2010 Vilnius</td>
<td>18.06.2010 Minsk</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Latvian Republic</td>
<td>-</td>
<td>23.03.2010 Riga</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Republic of Austria</td>
<td>11.05.2010 Vienna</td>
<td>10.05.2010 Vienna</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Republic of Poland</td>
<td>-</td>
<td>23.05.2010, Warszawa</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ukraine</td>
<td>31.03.2010 Kiev</td>
<td>29.06.2010 Luzk</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Russian Federation</td>
<td>-</td>
<td>-</td>
<td>Positive decision of Rostechnadzor is received № ВБ-46/578 of 12.11.2009</td>
</tr>
</tbody>
</table>

In the context of difference in national requirements to EIA content the developers of EIA followed the Addition II «The document content on environmental impact assessment » Espoo Convention with allowance for remarks, comments and proposals of the interested parties:

1. Description of planned activities;
2. Description, if appropriate, of reasonable alternatives (for example, geographical or technological character) of planned activity, including variant of refusal of activity;
3. The description of those elements of environment which, possibly, will be essentially mentioned by planned activity or its alternative variants;
4. The description of possible kinds of influence on environment of planned activity and its alternative variants and an estimation of their scales;
5. The description of the safety measures directed on reducing to a minimum harmful influence on environment;
6. Specific instructions on methods of forecasting and basic provisions laying in their basis, as well as corresponding used data on environment;
7. Recognition of blank spaces in knowledge and uncertainties which have been found out by compilation preparation of the required information;
8. If appropriate, the summary of monitoring and management programs and all plans of post-project analysis;
9. The summary of nontechnical character, if necessary, with use of visual means of the specified materials (cards, schedules etc).
2.2 Russian Federation

The letter of Federal agency on the ecological, technological and nuclear supervision. The conclusion.
2.3 Украина
1 Вставить Протокол общественных обсуждений в Украине 31.03.2010 г с. 25-56
2 вставить Протокол консультаций с украиной по АЭС с. 64-65.
2.3.1 Ответы на комментарии, вопросы и предложения

Поступившие комментарии, вопросы и предложения можно объединить в
следующие группы, на которые ниже приводятся ответы.

1. Объем представленной информации, ее соответствие Добавлению II
Конвенции Эспо.

В Добавлении II к Конвенции ЭСПО указано, что описание разумных
альтернатив планируемой деятельности, в том числе варианта отказа от
деятельности приводится при необходимости (пункт b). Поскольку решение о
строительстве АЭС принято в целях обеспечения энергетической безопасности
Республики Беларусь (наряду со строительством энергетических источников на
других видах энергии), в описании альтернативных вариантов, включая вариант
отказа от деятельности, отсутствует необходимость.

Оценка масштабов влияния планируемой деятельности на территорию
Украины, используемые исходные данные об окружающей среде Украины не
включены в отчет ОВОС по причине того, что выполненный анализ показал, что в
случае размещения белорусской АЭС на приоритетной (Островецкой) площадке,
трансграничное воздействие на Украину отсутствует.

При выполнении материалов ОВОС использовалась техническая
документация по объектам – аналогам. В части всех возникающих пробелов в
знаниях и неопределенностей проводились дополнительные исследования,
консультации и анализы. В настоящее время пробелы и неопределенност
не выявлены.

В отчете об ОВОС также указаны исходные данные, использованные при
выполнении ОВОС (включая информацию об объектах-аналогах, сведения об
окружающей среде района размещения АЭС, полученные в ходе изысканий и
следований). Методы прогнозирования воздействия АЭС общепринятые и в части
ядерной и радиационной безопасности нами использовался как стохастический,
так и вероятностный анализ безопасности.

Отчет об ОВОС содержит также резюме нетехнического характера, которое
оформлено в форме выводов по всему тексту отчета.

2. Воздействие белорусской АЭС на территорию Украины.

Как правильно отмечается в Questionах 1.5 Минприроды Украины, 4.2
Национальной академии наук Украины, 5.2 Института проблем национальной
безопасности Совета национальной безопасности и обороны Украины
воздействие на территорию Украины может быть описано путем использования
общих водотоков и воздушными потоками.

Приоритетная площадка для строительства белорусской АЭС (Островецкая)
расположена в пределах водосборного бассейна Балтийского моря, поэтому
невозможно загрязнение поверхностного стока бассейна р. Днепр и воздействие
на безопасность питьевого и хозяйственно-бытового водоснабжения Украины.

Для моделирования распространения радиоактивного загрязнения в
атмосфере при запроектной/максимальной проектной аварии в зависимости от
meteorологических условий использовалась автоматизированная система
анализа и прогноза радиационной обстановки RECASS NT (ФИАЦ Росгидромета
(ГУ НПО «Тайфун»)). Правильность подхода и полученных результатов
моделирования подтверждены заключением Федеральной службы по
экологическому, технологическому и атомному надзору Российской Федерации от 12.11.2009 № ВБ-46/578, копия которого прилагается.

Нормативные документы международных организаций выделяют следующие зоны аварийного планирования мер по защите населения и их размеры (для реакторов мощностью более 1000 МВт):

- зона предупредительных защитных мер (3 – 5 км) – зона вокруг АЭС, в отношении которой проводятся мероприятия для осуществления срочных защитных мер в случае ядерной аварийной ситуации с целью снижения риска появления тяжелых детерминированных эффектов за пределами площадки. Защитные меры в пределах этой зоны должны приниматься до или вскоре после выброса радиоактивного материала или облучения на основе обстановки, создавшейся на АЭС.

- зона срочных защитных мер (25 км) – зона вокруг АЭС, в отношении которой проводятся мероприятия, направленные на осуществление срочных защитных мер в случае ядерной аварийной ситуации с целью предотвращения стихастических эффектов в той степени, в какой это практически осуществимо, путем предотвращения доз в соответствии с международными документами. Защитные меры в пределах этой зоны должны выполняться на основе мониторинга окружающей среды или в надлежащих случаях с учетом обстановки, создавшейся на АЭС.

- зона ограничения потребления продуктов питания (300 км) – зона вокруг АЭС, в отношении которой проводятся мероприятия, направленные на осуществление контрмер (например, сельскохозяйственных), препятствующих пероральному поступлению радионуклидов с водой и пищевыми продуктами местного производства, и долгосрочных защитных мер с целью предотвращения больших коллективных доз облучения в той степени, в какой это практически осуществимо, путем предотвращения доз в соответствии с международными документами. Защитные меры в пределах этой зоны должны выполняться на основе мониторинга окружающей среды и продуктов питания.

Приведенные данные показывают, что в случае размещения белорусской АЭС на приоритетной площадке (Островецкой), трансграничное воздействие на территорию Украины отсутствует.

В случае изменения приоритетной площадки для строительства белорусской АЭС на резервную (Кукшиновская или Краснополянская), которые расположены в бассейне р. Днепр, в обязательном порядке будут выполнены следующие работы:

- разработан ОВОС белорусской АЭС для конкретной площадки;
- все необходимые материалы будут согласованы с украинской стороной.

3. Технические мероприятия с целью минимизации последствий воздействия на окружающую среду территории Украины.

Процедура и система быстрого уведомления соседних стран в случае аварии разрабатывается компетентными государственными органами в рамках выполнения обязательств по Конвенциям «Об оперативном оповещении о ядерной аварии» и «О помощи в случае ядерной аварии или радиационной аварийной ситуации» от 26 сентября 1986 года. Государственным органом, ответственным за исполнение указанных международных договоров от имени
Республики Беларусь определено Министерство по чрезвычайным ситуациям (далее - МЧС). На белорусской АЭС в соответствии с требованиями ТКП 112-2007 (02300) «Инженерно-технические мероприятия гражданской обороны» будут сооружены специальные пункты управления, оснащенные системами связи, контроля и мониторинга, обеспечивающие оперативную передачу информации об авариях и инцидентах в центр оперативного управления территориального органа МЧС. В дальнейшем МЧС будет осуществлять уведомление затрагиваемых государств.

Кроме того, в Республике Беларусь проводится постоянный мониторинг окружающей среды. Мониторинг окружающей среды проводится в рамках Национальной системы мониторинга окружающей среды (далее - НСМОС) в соответствии с законами Республики Беларусь и другими нормативными правовыми актами:

- Закон Республики Беларусь «Об охране окружающей среды»;

В соответствии с п.2 Положения о Национальной системе мониторинга окружающей среды в Республике Беларусь НСМОС включает организационно-самостоятельные и проводимые на общих принципах следующие виды мониторинга окружающей среды:

- мониторинг земель;
- мониторинг поверхностных вод;
- мониторинг подземных вод;
- мониторинг атмосферного воздуха;
- радиационный мониторинг;
- геофизический мониторинг и др.

Список контролируемых в природной среде радионуклидов определяется номенклатурой радионуклидов, выбрасываемых локальными радиационными объектами при их нормальной эксплуатации ($^{14}$C, $^{3}$H, инертные радиоактивные газы, $^{137,134}$Cs, $^{60}$Co, $^{54}$Mn, $^{131}$I, $^{89,90}$Sr, $^{232}$Th, $^{238}$U, $^{226}$Ra, $^{210}$Po), списком радионуклидов, формирующих техногенный ($^{3}$H, $^{137,134}$Cs, $^{90}$Sr, $^{239,240}$Pu $^{232}$Th, $^{238}$U, $^{226}$Ra,) и естественный ($^{232}$Th, $^{238}$U, $^{226}$Ra, $^{40}$K, $^{220}$Rn) радиационный фон, и вероятные дозовые нагрузки на население при гипотетических авариях ($^{131}$I, гамма-спектр).

Как правило, для контроля радиационной обстановки используются:

- метод гамма-спектрометрического анализа;
- метод радиохимического анализа;
- метод дозиметрического контроля.

Объектами наблюдения являются: приземный воздух, атмосферные выпадения, снег, компоненты наземных экосистем, компоненты лесных экосистем, компоненты аграрных экосистем, компоненты водных экосистем, поверхностные и подземные воды.

При этом, гамма-спектрометрический анализ является наиболее информативным методом и позволяет определять концентрации подавляющего большинства радионуклидов как естественного, так и техногенного происхождения в широком энергетическом диапазоне (50-2000 кЭв). Измерения проводятся на гамма-спектрометрах типа ADCAM-100, NOMAD, DAVIDSON (фирма ORTEC, США) с детекторами типа GEM и GMX, изготовленными из особо чистого германия. Гамма-спектрометры прошли государственную поверку в диапазоне регистрируемого излучения от 50 кЭв до 3000 кЭв с основной относительной погрешностью определения эффективности для доверительной
вероятности 0,95 менее ± 10 %. Проведение измерений и обработка результатов измерений проводятся с помощью пакета программ GAMMAVISION-32.

Учет замечаний, поступивших от Украины в процессе процедуры ОВОС белорусской АЭС, приведен в таблице П.3

Таблица П.3 – Учет замечаний Украины

<table>
<thead>
<tr>
<th>Объем представленной информации, ее соответствие Добавлению II Конвенции Эспо.</th>
<th>ОВОС, оглавление</th>
</tr>
</thead>
<tbody>
<tr>
<td>Воздействие белорусской АЭС на территорию Украины.</td>
<td>Section 15 Прогноз трансграничного воздействия белорусской АЭС</td>
</tr>
<tr>
<td>Технические мероприятия с целью минимизации последствий воздействия на окружающую среду территории Украины.</td>
<td>Section 17 Мероприятия по охране окружающей среды</td>
</tr>
</tbody>
</table>
2.4 Republic of Austria

1 Вставить Австрия финал 1199 кБ с.67-97
2 Вставить Австрия письмо 102 кБ с.98-99
3 Вставить австрия протокол 359 кБ с 100- 139.
2.4.1 REPLIES TO THE QUESTIONS

2.4.1.1 Introduction

The authors of the Report on EIA of the Belarusian Nuclear Power Plant express gratitude to Antonia Wenish, Helmut Hirsh, Andrea Walner who have prepared the expert opinion on EIA of the Belarusian Nuclear Power Plant by request of the Federal Ministry of Agriculture, Forestry, Ecology and Water Resources of Austria.

EIA of the Belarusian Nuclear Power Plant has been developed, in particular, on the basis of the following standard documents of the Republic of Belarus:

2. The Law of the Republic of Belarus dated June 18, 1993 «On the State Ecological Assessment»;
3. Instruction № 30 on the order of carrying out of environment impact assessment of the planned economic and other activity in the Republic of Belarus confirmed by the Decision of the Ministry of Natural Resources and Environment Protection of the Republic of Belarus dated June 17, 2005;

According to the standard documents EIA is being developed on the ground of the materials of the objects-analogues, therefore the replies to the questions concerning the technology of the concrete project of the Belarusian Nuclear Power Plant will be received at the stage of design works.

EIA of the Belarusian Nuclear Power Plant which has been finished taking into account the remarks received during carrying out of public discussions has been placed in the Global Network on the site of the Nuclear Power Plant Construction Directorate State Enterprise - dsae.by.

2.4.1.2 Replies to the questions

1. Can you give more detailed explanations of the reasons of a choice of water-moderated water-cooled power reactors-1200 with a view to the available operational experience with the components and the systems, or, probably, there were other reasons?

In the world market the following projects of the nuclear power plants with PWR reactors are being offered:

- AP-600, AP-1000, the projects have not been implemented anywhere. There are serious claims to the project on the part of the regulating bodies of the United Kingdom of Great Britain and Northern Ireland;
- Project EPWR - France carries out construction of the first nuclear power plants for the last 15 years in Finland and in France, construction is being executed with serious backlog from the schedule;
The Nuclear Power Plant-2006 Project. The Russian Federation is the only country which actively conducts construction of the Nuclear Power Plants with PWR-1000 reactors abroad within the last 10 years: China, India, Iran, and Bulgaria. Nuclear blocks on the Rostov Nuclear Power Plant have been put in operation in 2001 and on the Kалиnin Nuclear Power Plant in 2005, "Temelin" Nuclear Power Plant in 2001 and in 2002, the Tianwan Nuclear Power Plant in 2007. The closest prototype of the Nuclear Power Plant-2006 project has been commissioned in 2007 in the People’s Republic of China (2 power blocks). Two power blocks in India are being completed as per the Russian projects of the third generation. Construction of two power blocks in Bulgaria and four power blocks in the Russian Federation began. In September of 2009 the Report on Termination of guarantee operation of the second power block of the Tianwan Nuclear Power Plant has been signed. Both power blocks operate stably at the level of capacity of 1060 MW, have high technical and economic and operational indicators.

2. What are the reasons of a choice of variant V-491 instead of V-392 M, does it mean that you prefer active but not passive safety systems?

«Nuclear Power Plant-2006 Project» concept as a basis makes use of two projects: Nuclear Power Plant-92 Project developed by Atomenergoproject Public Corporation, city of Moscow (RP V-392M) and Nuclear Power Plants-91/99 Project developed by St.-Petersburg Atomenergoproject Public Corporation, city of St. - Petersburg (RP V-491).

The choice of the type of a nuclear reactor and, accordingly, the general designer, has been carried out by the special State Commission by the results of estimation of a complex of indicators, the major of which were safety and reliability characterized by a set of parametres and factors. In fact, Nuclear Power Plant-92 Project developed by Atomenergoproject Public Corporation initially contains more systems of passive safety (which also has been considered by us at estimation).

Also in the course of estimation of the projects we considered the following indicators and criteria: referency of the project; technical data; ecological characteristics; economic characteristics; radioactive waste and spent fuel disposal; discharges and emissions from the Nuclear Power Plant; the general characteristic of the general layout and the basic structures; the extended characteristics of materials consumption of the project.

Taking into account all the criteria, the Project of development of St.-Petersburg Atomenergoproject Public Corporation, city of St. - Petersburg (RP V-491) has been chosen for implementation of construction of the Nuclear Power Plant in the territory of the Republic of Belarus.

3. The EFFICIENCY factor specified in the Report (more than 96 %) is very high. What was the basis for the given assumption?

It is not a matter of efficiency factor of the Nuclear Power Plant (EFFICIENCY) – (approximately 34 %), but a matter of the rated capacity duty factor (RCDF) - : design number of operation hours - 8400, the general annual number of operation hours - 8760, RCDF = 8400/8760 =95,8 %.

4. Can you give the description of a passive system of injection of high-pressure boron (project, drawing, operating characteristics)?

The passive part of the system of emergency cooling of a zone is intended for delivery in a reactor of boric acid solution with concentration of at least 16 g/dm³ and tem-
temperature not less than 20 °C at a pressure in the first contour less than 5.9 MPa in a quantity sufficient for cooling of the active zone of a reactor before connection of the pumps of emergency injection of boric acid of low pressure in design-basis loss-of-coolant accidents.

The system consists of four independent channels with productivity of 50 % of each of them. In each channel one accumulator is being placed. Each accumulator is connected with the reactor by separate pipeline: two accumulators - with the front-end compartment of the reactor and two others - with the rear-end compartment of the reactor.

All the equipment of the system is located inside of the protective cover. Operation of the system is based on passive use of the energy of the compressed nitrogen, and for performance of safety functions (reflooding of the active zone) functioning of other systems is not required.

The drawings and operating characteristics will be submitted in the project.

5. What is the thickness of the walls (cylinder and dome) of the double protective cover of PWR-1200 reactors?

The Project provides for the constructive decision of the system of a sealed enclosure in the form of a double ferroconcrete cover. The space between the covers is connected to the ventilation system which provides for discharge and clearing of environment.

The thickness of the internal cover: a cylindrical part - 1200 mm, a spherical part - 1000 mm; the thickness of the external cover: a cylindrical part - 800 mm, a spherical part - 600 mm; a gap between covers - 1800 mm.

6. What are the characteristics of an air crash of the maximum force (weight of the plane, speed) which the reactor cover can sustain?

The weight of the plane - 5,7 tons, speed - 100 km/s.

7. Concerning external explosions. According to the Report, the maximum shock wave which the reactor cover can sustain appears to be low enough (10 kPa). On the other hand, in the literature higher figures have been specified. Which of these figures are true? What is specified in the specifications in the given concrete case?

The maximum shock wave which the cover can sustain: pressure 30 kPa, duration of impact - 1 second.

In TCP 170-2009 (02300) «General Provisions of Ensuring of Safety of Nuclear Power Plants» it is specified: «The systems and the elements important for safety should be capable to execute their functions in the volume established by the project taking into account influence of the natural phenomena (earthquakes, hurricanes, flooding possible around the Nuclear Power Plant site), the external technogenic events peculiar to the site chosen for construction of the Nuclear Power Plant, and/or possible mechanical, thermal, chemical and other impacts resulting in case of design-basis accidents» (point 7.6.1.).

8. How have the figures been received for the maximum loading at earthquake (numerical score, ground acceleration)?

The values have been received by means of calculation. Structural units of the buildings and facility are being designed with regard to maximum rated earthquake
0,12g - the maximum horizontal acceleration on a free ground surface (7 earthquake intensity as per scale MSK-64).

The equipment and the systems are being developed with regard to maximum rated earthquake 0,25 g - the maximum horizontal acceleration on a free ground surface (8 earthquake intensity as per scale MSK-64).

9. Can you present the description of the device of localization of the fusion? Whether the tests of this device took place and if yes, what sort of tests? For example, what are the guarantees of possibility to avoid steam explosion?

The device of localization of fusion is intended for reduction of radiation consequences of serious accidents in which destruction of the active zone is being caused by its long drainage at low pressure in the first contour with the subsequent melting of the case of a reactor to safe level. Safety increase is being achieved at the expense of exception of discharge of liquid and solid radioactive materials outside the device of fusion localization which provides for avoidance of the damage of the system of the sealed enclosure of the zone of localization of accidents. The process of serious accident can be accompanied by not only destruction of the active zone and its fusion, but also by destruction of the case of a reactor. In these conditions a paramount task is preservation of integrity (strength and density) of the leak-tight cover which can be solved by means of the devices and the procedures being specially developed for control of serious accidents.

The basic functions which are carried out by the device of localization of melt:

- Holding of the bottom of the reactor vessel with corium at its separation or plastic deformation till the moment of escape of corium from the reactor vessel;
- Protection of the elements of a concrete mine design and leak-tight cover against thermomechanical influences of corium;
- Reception and placing in the internal volume of the liquid and solid components of corium of the fragments of the active zone and structural materials of a reactor;
- Steady heat transfer from corium to cooling water and the guaranteed cooling of corium melt;
- Prevention of corium escape outside the established boundaries of a zone of localization;
- Keeping of subcriticality of corium in a concrete mine;
- Minimization of carrying-over of radioactive substances in the space of a leak-tight cover;
- Minimization of hydrogen outlet;
- Non-excess of the maximum pressure in the structures located in the premises of a concrete mine at thermal actions in the course of out-of-design-basis accident, as well as at possible static and dynamic loadings;
- Ensuring of protection against destruction of the basic supporting structures of a reactor and dry protection at a stage of long-term cooling of corium.

Ensuring of execution of these functions is based on a principle of passivity without use of the active elements and regulating actions on the part of operating personnel within, at least, 72 hours from the beginning of a heavy phase of out-of-design-basis accident.

The minimum sufficient information of the system of melt localization is represented in EIA [1]. The tests of the system of melt localization have been held at the Tianwan Nuclear Power Plant in the People's Republic of China.
More detailed replies to the questions put by you will be submitted in the design documentation (architectural design) of the Belarusian Nuclear Power Plant.

10. Can you present the description and characteristics of a passive system of bleeding from steam-gas generators (design, drawing, operating characteristics)? What role does the given system play in terms of long-term passive excess heat removal? What other systems exist for the given purpose? How has been proved reliability of their functioning?

At present the architectural design of the Belarusian Nuclear Power Plant is at the stage of development. The design will contain the drawings and operating characteristics of the system of passive heat removal from steam-gas generators. The project of technical requirements for the system of passive heat removal from steam-gas generators has been drawn up which will be without fail considered in the design of the Belarusian Nuclear Power Plant.

The system of passive heat removal from steam-gas generators is intended for active zone residual heat removal to a final absorber through the second contour at out-of-design-basis accidents.

The system carries out the following basic functions:
- residual heat removal and reactor shut-down cooling in the modes of complete de-energizing of the Nuclear Power Plant;
- residual heat removal and reactor shut-down cooling in the modes of complete loss of a feedwater;
- restriction of discharge of the radioactive coolant in the atmosphere through the fast reducing device (FRD-A) or steam-gas generator safety valves at the accidents with a leak of the coolant from the 1-st to the 2-nd contour at failure of design safety systems;
- Minimization of discharge of the radioactive coolant at the accidents with a leak from the 1-st to the 2-nd contour and steam line break in the non-cut part outside of a protective cover;
- ensuring of a reserve for the active systems of safety in case of their failure for emergency reactor shut-down cooling at the accidents with small and, partially, average leaks of the coolant of the first contour.

Productivity of the system has been chosen in terms of the conditions of the most probable scenarios of out-of-design-basis accidents being considered in the project and consists of four completely independent channels with productivity of \(4 \times 33.3\%\).

The system consists of four independent channels connected to the vapour and water zones of the corresponding steam-gas generators.

Heat exchangers of the system of passive heat removal from steam-gas generators are intended for heat transfer from steam-gas generators to the tanks of emergency heat removal of the system which are located outside of a concrete cover of a reactor compartment in the circular rigging around its spherical part. The system heat exchangers are submerged under a water level in the tanks and are located above steam-gas generators which provides for natural circulation in a system contour.

Also there is a system of passive heat removal from a protective cover, which is intended for long-term (off-line operation – at least 24 hours) heat removal from a protective cover at out-of-design-basis accidents.

The system provides for decrease and keeping of pressure inside the protective cover within the limits set by the project and heat removal to a final absorber at out-of-design-basis accidents with serious damage of the active zone.
Productivity of the system has been chosen in terms of the conditions of the most probable scenarios of out-of-design-basis accidents being considered in the project, and consists of four completely independent channels with productivity of 4×33.3 %.

System functioning is based on passive principles.

Heat-exchange surface of each of four independent channels amounts to 300 m². Condensation heat exchangers are located over gantry rails on the containment wall.

Heat from containment is being removed at the cost of steam condensation on the internal condensation heat exchanger from which it is being transferred to the tanks of emergency heat removal by means of natural circulation of the coolant. The water volume of the tanks of emergency heat removal of each of four independent channels amounts to 405 m³. Heat removal to a final absorber from the tanks of emergency heat removal is being carried out by water evaporation in the tanks within the first 24 hours from the beginning of the accident and their further feed at the cost of reserve water resources located on the site.

The system of passive heat removal from a protective cover enables to keep pressure under a cover in the whole spectrum of out-of-design-basis accidents connected with exit of mass and energy under a protective cover at a level below the rated one.

The data on reliability of functioning of the systems will be represented in the project.

11. Do the figures on probability of serious damages of the active zone and probability of maximum permissible discharge presented in the Report on water-moderated water-cooled power reactor-1200 cover all operating conditions of the nuclear power plant (full capacity loading, low power operation and shutdown), as well as all initiating factors (internal and external)?

The target probable indicators established for the power unit of the Nuclear Power Plant-2006 [2]:

- Decrease of probabilities of the accidents on the power unit with serious damage of the active zone of a reactor to the level of 10⁻⁶ 1/year-reactor and great discharges outside the territory of the site for which fast counter-measures outside the site are necessary with a level of 10⁻⁷ 1/year-reactor;
- Restriction of the maximum permissible discharge of the basic dose-forming nuclides to the environment at the serious out-of-design-basis accidents with probability of 10⁻⁷ 1/year-reactor with a level of 100 TBq of caesium-137.
- Decrease of maximum permissible discharge of the basic dose-forming nuclides to the environment at the serious out-of-design-basis accidents with probability of 10⁻⁷ 1/year-reactor, to the level at which:
  - Necessity of introduction of the immediate measures including both obligatory evacuation as well as long-term evacuation of the population outside the territory of the site; the nominal radius of a zone of planning of obligatory evacuation of the population does not exceed 800 m from the reactor compartment;
  - Obligatory introduction of protective measures for the population (shelter, iodine prevention) is limited by a zone with a radius of maximum 3 km from the unit.

The given target probability indicators cover all the operating conditions of the Nuclear Power Plant as well as all the initiating factors. The specified indicators of the technical requirements to the project of the Belarusian Nuclear Power Plant are defined as the obligatory ones.

12. Unclear aspect is connected with probability of events. In particular, whether 95 % quantile of probability of serious damages of the active zone and probability of maximum permissible discharge can be provided for?
The dose limits established for the Nuclear Power Plant-2006 power unit and target probability indicators completely meet the requirements of the valid Russian normative documents, the recommendations and safety norms of the International Atomic Energy Agency, the International Advisory Group on Nuclear Safety (INSAG1 - INSAG12) and to the requirements of the European exploiting organisations to the projects of the nuclear power plants of the new generation with reactors of the type PWR [3]. The Table P.4 represents for comparison the target indicators of radiation and nuclear safety of the power units with increased safety for various projects of the nuclear power plants and the requirement to them.

Table P.4 – Indices of Nuclear and Radiation safety of the NPP

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Quotas of population irradiation from discharge at normal operation of the NPP, μSv/year</td>
<td>Is not being regulated</td>
<td>50(50)</td>
<td>10(10)</td>
<td>-</td>
</tr>
<tr>
<td>Quotas of population irradiation from discharge at normal operation with regard to breaks of normal operation of the NPP, μSv/year</td>
<td>100</td>
<td>Is not being regulated</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Effective dose for the population at design-basis accidents, μSv/event</td>
<td>1</td>
<td>Is not being regulated</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>- with a frequency of more than 10^{-4} 1/year</td>
<td>5</td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>- with a frequency of less than 10^{-4} 1/year</td>
<td>-</td>
<td>5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Effective dose for the population at design-basis accidents, μSv/year</td>
<td>1E-5</td>
<td>1E-5</td>
<td>1E-6</td>
<td>1E-6</td>
</tr>
<tr>
<td>Probability of serious damage of the active zone, 1/year.reactor</td>
<td>1E-6</td>
<td>1E-7</td>
<td>1E-7</td>
<td>1E-7</td>
</tr>
<tr>
<td>Probability of serious discharge for which fast countermeasures outside the site are necessary, 1/year.reactor</td>
<td>1E-6</td>
<td>1E-7</td>
<td>1E-7</td>
<td>1E-7</td>
</tr>
</tbody>
</table>

The probabilistic analysis within the scope of the requirements [2-7] will be carried out in the course of development of the project of the Belarus Nuclear Power Plant and represented in the corresponding section of the design documentation.

13. The Report affirms that the Nuclear Power Plant-2006 corresponds to the requirements of EUR. Can you submit the additional information on the given problem? In particular, on the source of discharge which, how it is supposed, meets the requirements of «Criteria on the Limited Impact»?

The verification procedure for blocks PWR of the increased safety offered by EUR enables to connect the predicted emergency ground and high-altitude discharges of the certain list of radiation-significant nuclides with the necessity of introduction of protective measures outside of the industrial site irrespective of the conditions of localization of the site. The results of the verification procedures for out-of-design-basis accident with maximum permissible discharge at the Baltic Nuclear Power Plant (is the object-analogue) are presented in Table P. 5. Consideration has been carried out for the rated
emergency discharges; the calculations cover the radionuclides which form by more than 90% a predicted dose of irradiation.

Table P.5 – Results of Verification Procedure Recommended by EUR for NPP-2006

<table>
<thead>
<tr>
<th>Name of Criterion</th>
<th>Maximum value [EUR]</th>
<th>Design value for NPP-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out-of-design-basis accidents (frequency less than (10^{-5}) 1/year.reactor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion B1 – restriction on introduction of emergency protective measures at distances from the reactor of more than 800 m</td>
<td>(&lt;5\cdot10^{-2})</td>
<td>(1.2\cdot10^{-2})</td>
</tr>
<tr>
<td>Criterion B2 – restriction on introduction of delayed protective measures at distances from the reactor of more than 3 km</td>
<td>(&lt;3\cdot10^{-2})</td>
<td>(1\cdot10^{-3})</td>
</tr>
<tr>
<td>Criterion B3 – restriction on introduction of long-term protective measures at distances from the reactor of more than 800 m</td>
<td>(&lt;1\cdot10^{-1})</td>
<td>(1\cdot10^{-2})</td>
</tr>
</tbody>
</table>

It follows from the Table 2 data that the maximum permissible discharge of the Nuclear Power Plant-2006 accepted for radiotint-significant nuclides reliably meets the requirements of acceptance criteria of verification procedure which additionally confirms observance by the Baltic Nuclear Power Plant (is the object-analogue) of the following purposes:
- To exclude necessity of introduction of emergency evacuation and long-term evacuation of the population outside of the territory of the Nuclear Power Plant site;
- To limit a zone of planning of obligatory protective measures (population shelter, iodine prevention) for the population to the radius 3 km maximum.

The estimation of the limited impact on the economy has been carried out by comparison of the sum of discharge at ground level and high-altitude discharges during the accident with criteria as per EUR. The initial data for such comparison are presented in the Table P.6.

Table P.6 – Observance of Criteria of Limited Impact on Economics for the Baltic NPP

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Criterion as per EUR, TBq</th>
<th>Values of MPD for the Baltic NPP, TBq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out-of-design-basis accidents (frequency less than (10^{-5}) 1/year.reactor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(^{131})I</td>
<td>4000</td>
<td>100</td>
</tr>
<tr>
<td>(^{137})Cs</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>(^{90})Sr</td>
<td>400</td>
<td>0.12</td>
</tr>
</tbody>
</table>

From consideration of the data presented above the additional confirmation follows that the criteria of ecological safety of EUR for the Baltic Nuclear Power Plant (is the object-analogue) are being observed. Thus it is possible to make a conclusion that the set of the active and passive systems of safety being applied in the project of the Baltic Nu-
cler Power Plant completely provides for observance of the requirements of the ecological safety of EUR.

Since the verification procedure of EUR is the comparison of the criteria received as a result of multiplication of the value of the maximum permissible discharge of nine reference isotope groups by the standardized coefficients with the criteria accepted by EUR, the resulted conclusions are completely applicable also for the Belarusian Nuclear Power Plant.

14. Can you tell in more details about the requirements which are being lodged to the nuclear installation (besides EUR)?


The above-mentioned documents establish that safety of the Nuclear Power Plant should be provided for at the cost of consecutive implementation of the concept of deep-echelon protection based on use of the system of physical barriers on the way of distribution of ionizing radiation and radioactive substances in the environment and the systems of technical and organizational measures on protection of the barriers and preservation of their efficiency, as well as on protection of the personnel, the population and the environment.

The Nuclear Power Plant project should provide for technique and the organizational measures directed at prevention of the design-basis accidents and restriction of their consequences and providing for safety at any of the initial event being considered by the project with application according to the principle of a single failure of one failure independent of the initial event of the following elements of the systems of safety: of an active element or the passive element which have mechanical moving parts, or one error of the personnel independent of the initial event.

According to the concept of a deep-echelon protection, the Nuclear Power Plant should have the systems of safety intended for execution of the following basic functions of safety: emergency shutdown of a reactor and its keeping in subcritical state; emergency heat removal from a reactor; keeping of radioactive substances in the established boundaries.

The Project of the Nuclear Power Plant, the work paper of the systems and the elements important for safety should define, and for the safety systems and elements and the elements important for safety related to classes of safety 1 and 2, should be ready and checked prior to the beginning of physical start-up, adaptations and devices, as well as the programs and techniques designated for check up: of serviceability of the systems and the elements (including the devices located in a reactor), replacement of the equipment which has worked out its resource; tests of the systems for conformity to the design indicators; check of sequence of passage of signals and switching on of the equipment (including transfer to the emergency power sources); control of a state of metal and welded connections of the equipment and pipelines; check of metrological characteristics of the measuring channels for conformity to the design requirements.

The Nuclear Power Plant project should provide for the means which help to exclude individual errors of the personnel or to decrease their consequences, including those in the course of maintenance.
The safety systems should function so that their action will be performed till complete execution of their function. Returning of the system of safety to the initial condition should demand consecutive actions of the operator.

The active zone and other systems which define the operating conditions of the Nucler Power Plant should be designed so that to exclude excess of the established limits of safe operation of fuel elements damage throughout the term of use established for them. Excess of the specified limits also is not supposed at any of the following preliminary situations (taking into account action of the protective systems): any single failures in the control systems of a reactor installation; loss of power supply of the main circulating pumps; switching-off of turbogenerators and heat consumers; loss of all the sources of power supply of the normal operation; leaks of a contour of the reactor coolant being compensated by the charge circuits of the normal operation; a malfunction of one of the safety valves.

The active zone together with all its elements which influence on reactivity should be designed so that any changes of reactivity by means of the regulating units and the effects of reactivity in the operational conditions and at design-basis and out-of-design-basis accidents will not cause uncontrollable growth of energy release in the active zone which leads to the fuel elements damage beyond the established design limits.

All the equipment and pipelines of a reactor coolant contour should sustain without damage any static and dynamic loadings and thermal effects arising in any of its units and components, at all the initial events being considered, including indeliberate energy release to the coolant caused by: sudden introduction of positive reactivity at discharge of impact element on peak efficiency reactivity with the maximum speed if such discharge is not prevented by a design; input of the "cold" coolant to the active zone (at negative temperature factor of reactivity on the coolant) or by any other possible positive effect of reactivity connected with the coolant.

The Nucler Power Plant block should provide for the following systems of safety:

1. Control safety systems (CSS). CCS should carry out their functions automatically at occurrence of the conditions stipulated by the project. CSS should be designed so that at automatic start possibility of their switching-off by the operating personnel will be blocked within 10 - 30 minutes. CSS should be designed so that the started action will be performed till complete execution of their functions. Returning of the system of safety in its initial condition should demand consecutive actions of the operator.

2. Protective systems of safety. The Nucler Power Plant project should provide for the protective systems of safety providing for reliable emergency shutdown of a reactor and its keeping in a subcritical condition at any modes of normal operation and infringements of normal operation, including design-basis accidents. The efficiency and speed of the systems of emergency shutdown of a reactor should be sufficient for restriction of energy release by the level which does not lead to the fuel elements damage beyond the established limits for normal operation or design-basis accidents and suppression of the positive reactivity which appears as a result of display of any effect of reactivity or a possible combination of the effects of reactivity at normal operation and design-basis accidents. Emergency shutdown of a reactor should be provided for irrespective of the fact wheter there is the energy source or it has been lost.
3. Localizing systems of safety. Localizing systems of safety for keeping of radioactive substances and ionizing radiation in the course of accidents within the limits stipulated by the project should be provided for. The reactor and the systems and the elements of the Nuclear Power Plant which contain radioactive substances should be placed in airtight premises entirely for localization of radioactive substances being discharged at design-basis accidents within their boundaries. Thus, and also in case of other localization, it is necessary that at normal operation and design-basis accidents the corresponding established doses of irradiation of the personnel and the population, as well as the standards on discharge and content of radioactive substances in the environment will not exceed the standard levels. The necessity and admissibility of the directed discharge of radioactive substances at out-of-design-basis accidents should be grounded by the project. The localizing systems of safety should be provided for each block of the Nuclear Power Plant.

4. Secure systems of safety. The Nuclear Power Plant project should provide for the necessary secure safety systems which carry out the functions of supply of the safety systems with an operating environment, energy and creations of the necessary conditions of their functioning, including heat transfer to a final absorber. Secure safety systems should have the indicators of reliability of performance of the set functions sufficient for possibility to achieve the necessary reliability of functioning of the last being defined in the project together with the indicators of reliability of the safety systems which they provide for. Performance of the specified functions by the secure safety systems should have an unconditional priority over the action of internal protection elements of the secure safety systems if it does not lead to heavier consequences for safety; the list of the internal protections of the elements of the secure safety systems which are not subject to disconnection should be grounded in the Nuclear Power Plant project. The Nuclear Power Plant project should provide for necessary and sufficient means for fire protection of the Nuclear Power Plant, including sensors and burning suppressions of the inhibitor and the coolant. The Nuclear Power Plant project should provide for the automated operating mode of the systems of fire control from the moment of voltage supply on the equipment of the block of the Nuclear Power Plant in the course of carrying out prestarting adjustment works. Automatic protection of a reactor should have at least two independent groups of actuators.

15. Whence the data on characteristics of a source of discharge presented in the Report have been taken? Why more considerable figures of discharge are not being analyzed?

The data on the characteristics of a source of discharge have been taken from the analysis of the following materials:


The amount of discharge of the reference isotopes iodine-131 = 3,1 E+15 and caesium-137=3,5E+14 to the environment has been chosen on the following basis: at out-of-design-basis accidents the integrity of a protective cover is being retained for at least 24 hours, leakings through the containment - 0,2 % per 24 hours and discharge lapses in a 24 hours period. Thus, as a result of an out-of-design accident the following elements have been thrown to the containment:

- Iodine - 131: 3,1 E+15: 0,002 = 1,55 E+18;
- Caesium - 137: 3,5E+14: 0,002 = 1,75 E+17.

The given values of activity of the reference isotopes properly co-ordinate with the emergency discharge of the Chernobyl Nuclear Power Plant (iodine 131 = 2,7 E+17 Bq, caesium 137 = 3,7E+16 Bq).

16. What figures of discharge represent the most serious scenarios and what are the maximum permissible discharges?

The Nuclear Power Plant-2006 project establishes the maximum permissible discharge with regard to the achieved level of safety for a class of serious accidents on the block [8]:

- For the early phase of the accident connected with leaks of radioactive substances through thinnesses of a double protective cover and bypass of the containment, in absence of power supply on the block: xenon-133 - 10^4 TBq; iodine-131 - 50 TBq; caesium-137 - 5 TBq.
- For the intermediate phase of the accident, after power supply restoration on the block, connected with discharge through a ventilation pipe: xenon-133 - 10^5 TBq; iodine-131-50 TBq; caesium-137 - 5 TBq.

For estimation of the maximum permissible discharge the analysis of radiation consequences of a reference scenario of the serious accidents connected with slow growth of pressure in the containment (total probability approximately 10^{-7} 1/year.reactor) according to the recommendations of the IAEA for the Nuclear Power Plant with PWR [9] has been carried out. Within a framework of the Report the maximum permissible discharge has been used for preliminary estimation of the scope of protective measures for the population at serious accidents on the power unit.

Table P.7 represents the rated values of the maximum permissible discharge and the requirement to them established in various countries and the projects for com-
Comparison. Implementation of the planned strategy in the projects has lowered the rated levels of the maximum permissible discharge grounded according to the requirements specified above.

### Table P.7 – Maximum Permissible Discharge and Requirements to them, TBq

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Xenon-133</td>
<td>Is not being regulated</td>
<td>Is not being regulated</td>
<td>$10^5$</td>
<td>$10^5$</td>
<td>$3.10^5$</td>
</tr>
<tr>
<td>Iodine-131</td>
<td>Maximum 1000</td>
<td>Is not being regulated</td>
<td>600</td>
<td>100</td>
<td>349</td>
</tr>
<tr>
<td>Cesium-137</td>
<td>Maximum 100</td>
<td>Maximum 100</td>
<td>50</td>
<td>10</td>
<td>5,6</td>
</tr>
<tr>
<td>Strontium-90</td>
<td>Is not being regulated</td>
<td>Is not being regulated</td>
<td>1</td>
<td>0,12</td>
<td>0,15</td>
</tr>
</tbody>
</table>

17. Are the authors of the Report on EIA aware of the results of preliminary reports on safety at the Leningradskaya Nuclear Power Plant-2 and the Novovoronezhskaya Nuclear Power Plant-2 (Nuclear Power Plant- (Water-cooled water-cooled power reactor-1200/491)) which are at a stage of construction?

Yes. In the course of preparation of the materials on EIA the following materials on the objects-analogues have been studied and used:


18. What scenarios on the maximum design-basis accidents and out-of-design-basis accidents have been analyzed by the designers of the Nuclear Power Plant?

For objectivity of the Report the consequences of the most serious out-of-design-basis accident have been considered. Among four types of out-of-design-basis accidents the most serious consequences, from the point of view of the radiation damage result in out-of-design-basis accidents of the third type. In this case due to complete de-energizing of the Nuclear Power Plant cooling of the active zone of a reactor stops. It leads to serious damages of the nuclear fuel, but the protective cover keeps its tightness. As per the 7-level scale accepted by the IAEA such accident has the fifth level of severity. Namely at such accident the maximum possible discharge of caesium-137 of all the types of out-of-design-basis accidents takes place, and the total intensity of dis-
charge is approximately by 80 times more than that at the maximum design-basis accident. Discharge of radioactive substances at the accident would proceed about 24 hours [11].

19. Can you describe the measures on control of the nuclear reactor accidents and the corresponding measures which can provide for the least discharge in case of out-of-design-basis accident?

The analysis of the reference out-of-design-basis accident at Nuclear Power Plant-2006 (the Nuclear Power Plant-92 project) is presented in [12]. The basic purpose of ensuring safety of the Nuclear Power Plant at out-of-design-basis accident consists in achievement and maintenance of a safe state of the Nuclear Power Plant (Servere Accident Safe State) at serious accident not later than within 7 days in one week from the accident beginning. For this purpose it is necessary to carry out the following conditions:

- The fragments of an active zone are in a solid phase, and their temperature is stable or decreases;
- Heat release of the fragments of the active zone is being removed and transferred to a final absorber of heat, the configuration of the fragments is such that efficiency factor is much more lower than 1;
- Pressure in the zone of a protective cover is so low that in case of loss of sealing of the protective cover the criterion of restriction of radiation consequences for the population is being observed;
- The outlet of fission products in the zone of a protective cover has stopped.

For ensuring of integrity and tightness of a design of a protective cover at serious out-of-design-basis accidents the project provides for:

- Prevention of early damage of the internal protective cover;
- Prevention of late failure of the protective cover at the cost of the corresponding measures, such as:
  - Ensuring of heat removal and localization of melt in a trap, exclusion of direct impact of a melt on a protective cover, the base, concrete of reactor mine;
  - Prevention of accumulation of potentially dangerous concentration of hydrogen.

The initial events of the reference out-of-design-basis accident are as follows:

- Break of the basic circulating pipeline Du 850 in the input of the reactor with bilateral blowdown;
- Loss of the sources of an alternating current and, accordingly, nonserviceability of all the active safety systems for the long period of more than 24 hours, failure of start of all diesel-generator sets; emergency supply is being carried out from the storage batteries.

Dynamics of development of the serious out-of-design-basis accident is presented in Table P.8.
### Table P.8 – Development of a Serious Out-of-Design-basis Accident

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break of the reactor coolant pipe PD 850 on outlet of the reactor. Loss of all the sources of AC</td>
<td>0,0 s</td>
<td>Initial event</td>
</tr>
<tr>
<td>Deactivation of all the reactor coolant pipes. Deactivation of the system of infeed-blowdown. Prohibition on switching on of fast reducing devices of steam dumping FRD-C</td>
<td>0,0 s</td>
<td>Application of failure: loss of all the sources of AC of the NPP including all the diesel generators</td>
</tr>
<tr>
<td>Actuation of an emergency protection system</td>
<td>1,9 s</td>
<td>By the fact of de-energizing of the block with delay of 1,9 s</td>
</tr>
<tr>
<td>Start of work of the accumulator of the system of emergency cooling of the active zone</td>
<td>8,0 s</td>
<td>Decrease of pressure of the first contour below 5,9 MPa</td>
</tr>
<tr>
<td>Start of the system of passive heat removal</td>
<td>30,0 s</td>
<td>By the fact of de-energizing on the section of safe power supply with delay of 30 s</td>
</tr>
<tr>
<td>Loss of borated water supply from the accumulator of the system of emergency cooling of the active zone</td>
<td>144,0 s</td>
<td>Decrease of the level in the tanks of accumulator of the system of emergency cooling of the active zone till the mark of 1,2 m</td>
</tr>
<tr>
<td>Start of steam condensation in the pipe heater of the steam generator</td>
<td>3600,0s</td>
<td>Parameters of the second contour are lower than those of the first contour</td>
</tr>
<tr>
<td>Start of hydrogen generation in the active zone at the cost of the oxidation reaction</td>
<td>44,6 h</td>
<td>T of fuel elements &gt; 1000 °C</td>
</tr>
<tr>
<td>Decay of the active zone and start of accumulation of the decayed materials of the active zone and vessel internals in the lower mixing chamber</td>
<td>47,7 h</td>
<td></td>
</tr>
<tr>
<td>Melting of the support grid in the lower mixing chamber and accumulation of the parts of the active zone on the bottom of the reactor vessel.</td>
<td>51,0 h</td>
<td>T of the support grid &gt; 1500 °C</td>
</tr>
<tr>
<td>Decay of the reactor vessel and start of escape of the melt in the melt localization device</td>
<td>52,0 h</td>
<td>T of the case &gt; 1500 °C</td>
</tr>
</tbody>
</table>

For the purpose of minimization of the consequences of a serious out-of-design-basis accident the following systems are being applied:

- The system of heat removal from the hermetic casing (sprinkler system);
- The system of emergency and planned shut-down cooling of the first contour;
- The system of control of concentration and emergency removal of hydrogen;
- The system of catching and cooling of the fused active zone out of a reactor.

The purposes being achieved at operation of the given systems of safety are represented in Table P.9.
Table P.9 – Result of Operation of Safety Systems at Control of Out-of-Design-Basis Accident

<table>
<thead>
<tr>
<th>Safety System</th>
<th>Period of Operation</th>
<th>Achievable Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>System of hydrogen emergency removal</td>
<td>Within the whole period of an accident</td>
<td>Ensuring of hydrogen nonexplosiveness</td>
</tr>
<tr>
<td>System of passive heat removal, System of accumulators of the second grade</td>
<td>Before transfer to the heavy stage</td>
<td>Prevention of the early damage of the protective cover. Ensuring of heat removal from the protective cover and fuel.</td>
</tr>
<tr>
<td>System of collection and cooling of the molten active zone</td>
<td>After decay of the reactor vessel and transfer of the accident to the out-of-vessel stage</td>
<td>Achievement of the safe state of the NPP (SASS). Provision of heat removal and localization of a melt in a trap. Termination of fission products outlet to the protective cover zone.</td>
</tr>
<tr>
<td>Sprinkler system. System of emergency and design shutdown cooling of the first contour</td>
<td>In three days after beginning of the accident</td>
<td>Achievement of the safe state of the NPP (SASS). Decrease of pressure in the zone of the protective cover. Provision of heat removal from the protective cover and fuel. Prevention of late failure of the protective cover.</td>
</tr>
</tbody>
</table>

Consideration of the list of out-of-design-basis accidents, the scenarios of development and their consequence serve for working out of the guidance on control of the out-of-design-basis accidents and drawing up of the plans of the measures on protection of the personnel and the population in case of these accidents. The final lists of out-of-design-basis accidents, their realistic analysis which contains estimation of probabilities of the ways of behaviour of out-of-design-basis accidents are being established in the project of the Nuclear Power Plant and in the Report on substantiation of safety of the Nuclear Power Plant. The given documents will be developed at the subsequent stages of designing of the Belarusian Nuclear Power Plant.

20. What levels ofradioactivity do you use for classification of radioactive waste (high, average, low)?

Classification of solid and liquid radioactive waste by degree of their activity or radiation impact is being carried out according to criteria [13 - 15] which are represented in Table P.10.
Table P.10 – Classification of Solid and Liquid Radioactive Waste on Specific Activity

<table>
<thead>
<tr>
<th>Category of Waste</th>
<th>Radiation level, mSv/h</th>
<th>Specific Activity, kBq/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gamma-emitting</td>
<td>Beta-emitting</td>
</tr>
<tr>
<td>Low-activity</td>
<td>from 0.3 to 10 μSv/h</td>
<td>Less than 10³</td>
</tr>
<tr>
<td>Medium-activity</td>
<td>from 0.3 to 10 μSv/h</td>
<td>from 10⁷ to 10⁸</td>
</tr>
<tr>
<td>High-activity</td>
<td>More than 10 μSv/h</td>
<td>More than 10⁷</td>
</tr>
</tbody>
</table>

The additional classification of solid radioactive waste recommended [13, 15] and practiced at operation in respect of solid waste is their classification by the levels of capacity of a dose of gamma radiation at a distance of 0.1 m from a surface:

- low-activity - from 1 μSv/h to 300 μSv/h;
- medium-activity - from 0.3 μSv/h to 10 μSv/h;
- high-activity - more than 10 μSv/h.

21. Are there any plans of construction of intermediate warehouses for the spent fuel?
No. The spent nuclear fuel being unloaded from a reactor is being stored in the cooling pond (storage at least three years for activity and residual heat release decay) located in a reactor building. The capacity of a cooling pond provides for storage of the spent nuclear fuel within ten years, including placing defective fuel assemblies in hermetic containers, as well as the possibility of unloading of the whole active zone of a reactor at any moment of Nuclear Power Plant operation. In the course of unloading of a reactor export of the exposed spent nuclear fuel from the Nuclear Power Plant site to the factory for fuel regeneration of the Russian Federation is being carried out.

22. Is construction of a place of active nuclear waste utilization in the Republic of Belarus being planned?
In the Republic of Belarus construction of the regional centre for storage of the radioactive waste being formed as a result of use of nuclear technologies in various spheres of human vital activity, including in nuclear power engineering, is being planned.

The spent nuclear fuel does not relate to radioactive waste and will be returned to the Russian Federation for reprocessing.
### 2.4.1.3 List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIA</td>
<td>Environment Impact Assessment</td>
</tr>
<tr>
<td>NPP</td>
<td>Nuclear Power Plant</td>
</tr>
<tr>
<td>WMWCPR</td>
<td>Water-moderated Water-cooled Power Reactor</td>
</tr>
<tr>
<td>RP</td>
<td>Reactor Plant</td>
</tr>
<tr>
<td>EF</td>
<td>Efficiency Factor</td>
</tr>
<tr>
<td>CF</td>
<td>Capacity Factor</td>
</tr>
<tr>
<td>TCSP</td>
<td>Technical Code of Standard Practice</td>
</tr>
<tr>
<td>MPD</td>
<td>Maximum Permissible Discharge</td>
</tr>
<tr>
<td>ND</td>
<td>Normative Documents</td>
</tr>
<tr>
<td>FA</td>
<td>Fuel Assembly</td>
</tr>
<tr>
<td>FE</td>
<td>Fuel Element</td>
</tr>
<tr>
<td>ODBA</td>
<td>Out-of-Design-Basis Accident</td>
</tr>
<tr>
<td>PD</td>
<td>Passage Diameter</td>
</tr>
<tr>
<td>FRD-A</td>
<td>Fast Reducing Device of Vapour Escape in Atmosphere</td>
</tr>
<tr>
<td>FRD-C</td>
<td>Fast Reducing Device of Steam Dumping</td>
</tr>
<tr>
<td>SF</td>
<td>Spent Fuel</td>
</tr>
</tbody>
</table>
2.4.1.4 LIST OF LITERATURE


2.4.3 ANSWERS TO THE QUESTIONS OF AUSTRIA WHICH HAVE NOT BEEN CONSIDERED DURING CONSULTATIONS ON MAY 10, 2010 IN VIENNA

COMMENTS

In EIA of the Belarusian Nuclear Power Plant it has been stated that the analogues of the project of Nuclear Power Plant -2006 are the project of Nuclear Power Plant-92 and Nuclear Power Plant-91/99. The given projects have passed the International examination: Nuclear Power Plant-92 has the Certificate EUR of year 2007, Nuclear Power Plant-91/99 project has positive conclusions of the International Atomic Energy Agency, and therefore they completely meet the International requirements (IAEA, EUR).

The executed estimation of the project of Nuclear Power Plant-92 has shown a good level of conformity of the project of Nuclear Power Plant-92 to the purposes and requirements of EUR, including on the following principle positions:

- Completeness of probabilistic estimate of safety;
- Results of joint tests on the system of passive heat removal (SPHR) and the system of gas removal;
- Service life of the reactor vessel;
- Principles of construction of the system of afterheat cooling of the reactor;
- Resources (potential) of the active zone: possibility of operation with MOX-fuel at 24-months fuel cycle;
- Use of seismic spectra and the soil conditions recommended by EUR.

The safety requirements have been stated in the document of EUR, Volume 2 SAFETY REQUIREMENTS, Chapter 1 (part 2), Version C, Edition 10, April of 2001.

The concrete specified indicators received by the results of the probabilistic analysis of safety of the Belarusian Nuclear Power Plant will appear in the course of drawing up of the draft contract of the Belarusian Nuclear Power Plant development of which has not begun yet.

QUESTION 16. Can you list internal and external initiating factors which have been taken into consideration in the course of probabilistic analysis of safety for water-moderated water-cooled power reactor-1200?

QUESTION 17. It is obvious that the probabilistic analysis for water-moderated water-cooled power reactor-1200, the basis of the engineering project for which is Nuclear Power Plant- 2006, has been already carried out since the values of nuclear damage frequency and frequency of significant emissions are known. Can you give the information about uncertainties of probabilistic analysis (for example, by submission of 95 % quantiles)?

Within the framework of grounds of safety the following categories of the initial events have been considered:

1. Violation of the normal conditions of operation;
2. Design accidents;
3. Out-of-design accidents;

According to their functional influence on reactor plant and the Nuclear Power Plant the initial events connected with violation of the normal operating conditions and design accidents have been devided into the following groups:
1. Heat removal increase by the second contour;
2. Heat removal decrease by the second contour;
3. Decrease of the coolant heat consumption of the first contour;
4. Abnormalities of reactivity and power distribution;
5. Increase of the coolant quantity of the first contour;
6. Decrease of the coolant quantity of the first contour;
7. Radioactive discharges from a subsystem or a component;
8. Failures in the protective cover of the reactor;
9. Loss of the coolant of the 1st contour with leak in atmosphere or the system of the second contour.

The approximate list of design initial events for analysis of safety and acceptance criteria.

The below-mentioned list of initial events is intended for analysis of safety and substantiation of observance of acceptance criteria, at that the scenarios and the modes characteristic for the reactor plants completely correspond to the contents of Appendix D to «the Objective on development of the design project of the reactor plants Water-moderated water-cooled power reactor-1200»:

1. Discharge of radioactive media from the systems and equipment of other contours and systems.
   1.1. Leak of radioactive media through equipment seals.
   1.2. Leak of pipelines in the systems of transportation, storage and processing of radioactive waste.
   1.3. Leak and discharge of media from the capacity containing radioactive substances.
   1.4. Discharge of radioactive media at accidents with fuel:
       - at overloads;
       - at fall of the container with fuel.
   1.5. Leak from the cooling pond or pipeline breaking which leads to decrease of a water level in the pond.
2. Violations in the course of nuclear fuel handling.
   2.1. Fall of separate fuel assemblies, cases, covers with fuel assemblies at transport-technological operations.
   2.2. Fall of the subjects which can change the location and break the integrity of fuel assemblies and covers of the fuel elements (including in the reactor and the cooling pond).
   2.3. Hang of the spent fuel assemblies in the course of execution of reloading works.
   2.4. Failures of the equipment of the complex of the systems of nuclear fuel storage and handling.
   2.5. Decrease of concentration of a homogeneous absorbent in the water of a cooling pond.
   2.6. Violation of integrity of packings during transportation of nuclear fuel.
   2.7. Fall of the transport container with the spent fuel assemblies.
3. Fires:
   - In cable subways, premises, trays;
   - On block control board or reserve control board;
   - In a turbine island;
   - On RDEPP (reserve diesel-engine power plant);
   - In the premises containing the equipment with oil;
- In the premises of nuclear fuel storehouses;
- In the premises of SC.
4. Fall of heavy subjects
5. Flooding of the premises
6. Seismic impacts
7. Shock waves
8. Flooding
9. Crash of an airplane
10. Loss of the cooling water
11. Extreme wind, snow influences and other natural phenomena and technogenic influences.

Spectrum of the accidents in the block with water-moderated water-cooled power reactor -1000 (RP B-428) is shown in the Table P.11.

**Table P.11 - Spectrum of the accidents**

<table>
<thead>
<tr>
<th>Group of Accidents</th>
<th>Initial Event</th>
<th>Probability of Event 1/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Design accidents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I.1</td>
<td>Spectrum of the accidents with leak of the coolant from the first contour to the second contour</td>
<td></td>
</tr>
<tr>
<td>I.2</td>
<td>Steam generator (SG) heat-exchange tube rupture with further reactor shut-down cooling at a rate of $60^3$C/h Leak from the first contour to the second within SG ($D_y &lt; 100$ mm)</td>
<td>$&lt;10^{-3}$ $&lt; 5\times 10^{-4}$</td>
</tr>
<tr>
<td>II Out-of-Design-Basis Accidents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Failure of all the ac sources for 24 hours Loss of the coolant at small breaks with a failure of the active part of the system of the active zone emergency cooling</td>
<td>$&lt; 4\times 10^{-7}$ $&lt; 5\times 10^{-8}$ $&lt; 3\times 10^{-10}$</td>
</tr>
<tr>
<td>1.2</td>
<td>Failure of the coolant at small breaks with a failure of the active part of the system of the active zone emergency cooling</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Failure of the coolant at large breaks with a failure of the active part of the system of the active zone emergency cooling</td>
<td></td>
</tr>
<tr>
<td>2 Group</td>
<td>Steam pipeline rupture outside and inside of the shelter wall (before direct-admission gate valve) with simultaneous rupture of one heat-exchange tube in abnormal steam generator (SG)</td>
<td>$&lt;10^{-8}$</td>
</tr>
</tbody>
</table>
QUESTION 24 In your replies, if to compare them to the preliminary Report on EIA, you give a new critical parameter of discharge: 3100 TBq of iodine-131 and 350 TBq of caesium-137 as the heaviest case of a discharge. We ask you to explain why has been chosen the given critical parameter of discharge?

In the Instructions № 30 «On the Order of Execution of Assessment of the Influence on Environment of the Planned Economic and Other Activity in the Republic of Belarus» dated June 17, 2005 it is told that the assessment should be carried out for the conservative (the worst) conditions. The radiation doze limits established for Nuclear Power Plant-2006 and target probabilistic measures completely meet the requirements valid for the Russian standard documentation, to the recommendations and the norms of safety of IAEA, the International Consultative Group on Nuclear Safety (INSAG1 - INSAG12) and to the requirements of the European exploiting organisations to the projects of the nuclear power plants of the new generation with reactors of type PWR.

As a part of the Nuclear Power Plant-2006 project the maximum discharge has been established on the basis of the achieved level of safety for a class of serious accidents in the block [the Preliminary Report on a Substantiation of Safety of the Leningrad Nuclear Power Plant-2, Chapter15, the Analysis of Accidents, Book 7. SpbAEP FSUE, 2007]:

- For the early phase of the accident connected with the leaks of fission products (FP) through the leakinesses of the double containment shell and bypass of the containment, in absence of power supply in the block: xenon-133 - \(10^4\) TBq; iodine-131 - 50 TBq; caesium-137 - 5 TBq.

- For the intermediate phase of the accident after power supply restoration in the block connected with discharge through a ventilation pipe: xenon-133 - \(10^5\) TBq; iodine-131-50 TBq; caesium-137 - 5 TBq.

For working out of the maximum discharge levels the analysis of the radiation consequences of the reference scenario of the serious accidents connected with slow increase of pressure in the containment has been carried out (total probability of the order of \(10^{-7}\) 1/year×reactor) according to the recommendations of IAEA for the nuclear power plants with PWR [A simplified approach to estimating reference source terms for LWR desing is made. IAEA-TECDOC-1127].

In EIA of the new Lithuanian Nuclear Power Plant «NNPP_EIAR_D2_Combined RU_200808FINAL» the Finnish experts consider the influence outside of the state frontiers of the serious hypothetical accident of the category 6 («serious accident») at maximum discharge level about 100 TBq \(^{137}\)Cs according to the maximum value established by the Decision of the Government of Finland (395/1991). For estimation of the influence caused by the accident discharge of other nuclides which form more than 90 % of a predicted dose of radiation have been simulated, for proportion of their contents in the active zone of a reactor (for example discharge \(^{131}\)I has amounted to 1500 TBq).

The discharge is being simulated as high-altitude in 24 hours after the beginning of the accident on the basis of the requirements of the American instructions of NRC, as well as the European requirements (EUR, 2001) to containment integrity preservation within the first 24 hours of the accident and to the conditions of its failure. It is being affirmed that there are no grounds for inclusion of an estimation of radiation accident more serious than category 6 as per INES, in EIA, since for receipt of the licence for construction and exploitation of the nuclear power plant in Finland occurrence of such an accident should be practically impossible.
For estimation of the consequences of an out-of-design-basis accident in EIA of the Belarusian Nuclear Power Plant surface discharge 3100TBq of iodine-131 and 350 TBq of caesium-131 has been considered. The value of such discharge has been offered for water-moderated water-cooled power reactor-1000 with reactor plant V-320, which, in our opinion, corresponds to the conservative estimation provided for by the standard documents of Belarus.

QUESTION 28. Can you show the systematic list of the considered scenarios of design-basis and out-of-design-basis accidents?

**List of design-basis accidents**

**Name of Mode**

Spectrum of ruptures of steam lines inside and outside of the containment up to the maximum diameter of the steam pipeline

Indeliberate closure of cutoff valve on a steam line with the subsequent non-fit of pulse-emergency gear of the abnormal SG which leads to emergency decrease of to pressure in the system of steam lines of the working steam

Rupture of the pipeline of a feed water

Instant jamming of a shaft of a reactor coolant pump

Rupture of a shaft of the reactor coolant pump

Wrong loading and operation of fuel assemblies in inadequate position

Spectrum of the accidents with discharge of the absorber of the system of control and protection (in each case simultaneously one absorber of the system of control and protection )

Indeliberate opening and non-fit of the pulse-emergency gear of pressure compensator

Accident with a leak of the coolant as a result of a spectrum of ruptures of the pipes with diameter up to 100 mm inclusive within the boundaries of pressure of the first contour:
- without exposure of the active zone;
- with exposure of the active zone.

Accident with a leak of the coolant as a result of a spectrum of ruptures of the pipes with diameter of more than 100 mm up to 850 mm

Leak or damage of the systems which contain radioactive gas

Accidents at fuel overload

Accidents inside of the containment with the container of the spent fuel

Damage outside the containment of the lines containing the coolant of the first contour:
- compensatory leak;
- uncompensatory leak.

Fast reactor plant shutdown cooling at a rate of 60oC/h after rupture of the SG tube

Separation of a cover of SG collector of the first contour and the subsequent damage of SG cover of the second contour

Separation of a cover of SG collector of the first contour (equivalent diameter of 0,043 m)

**List of out-of-design-basis accidents**

**Name of the accident**

Loss of all the sources of power supply of the Nuclear Power Plant except for storage batteries for 24 hours

Leak of the reactor vessel with a rate of no more than 10 t/h

Accident with separation of a reactor pit

Long-term termination of removal of residual heats to the final absorbent at:
- at stopped reactor;  
- at overloading

Reactor shutdown cooling at operation of one steam generator

Spectrum of ruptures of steam lines inside and outside of the containment up to the maximum diameter of the steam pipeline with rupture of one tube in a steam generator

**Question 29.** Can you submit more detailed information on the types of the scenarios of out-of-design-basis accidents (apparently, it means, which have been considered by you - the note of the translator). Besides of de-energizing of the Nuclear Power Plant?

In practice we consider 4 types of out-of-design-basis accidents (ODBA):

- The accident when inside of a containment shell of the first contour the coolant leaks. At that all safety systems operate normally, and there are violations in functioning of a containment shell;
- The accident with simultaneous leak of the coolant of the first contour and failures of some systems of emergency cooling;
- The accident with de-energizing of the nuclear power plants and with impossibility of start of four emergency diesel engines of the safety systems within the first 24 hours;
- The accident with a leak of the coolant of the first contour to the second contour.

At the stage of EIA of the Belarusian Nuclear Power Plant the data on referential out-of-design-basis accident have been stated «Providing for Localising Functions of a Containment Shell".


For more detailed acquaintance with the concept of safety of the project of Nuclear Power Plant -2006 it is recommended for the authors of the questions to be acquainted with the following works:

1. Peculiarities of the concept of safety of the project of Nuclear Power Plant-2006 on the site of the LNPP-2 Onufrienko S.V., Bezlepkin V.V., Molchanov A.V., Svetlov S.V., Solodovnikov A.S., Semashko S.E.
2. Peculiarities of the concept of safety of the project of Nuclear Power Plant-2006 on the site of the LNPP-2 Molchanov A.V., Bezlepkin V.V., Svetlov S.V., Solodovnikov A.S., Semashko S.E., Ivkov I.M.

2.4.4 Letter and minutes of public hearings in Vienna.  
2.4.5 The conclusion by results of consultations.
### 2.4.6 Account of remarks, received from Republic of Austria during EIA of Belorussian APS

#### Table P.11 – Remarks accounting of Republic of Austria

<table>
<thead>
<tr>
<th>Question</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can you give more detailed explanations of the reasons of a choice of water-moderated water-cooled power reactors-1200 with a view to the available operational experience with the components and the systems, or, probably, there were other reasons?</td>
<td>Section 6.6.6 Reference of the capital equipment of turbine installation</td>
</tr>
<tr>
<td>What are the reasons of a choice of variant V-491 instead of V-392 M, does it mean that you prefer active but not passive safety systems?</td>
<td>It is not EIA subject (Addition II) The choice reactor installation type was carried out under the special program outside the EIA limits. The result of such choice was initial data for EIA. During the choice the indicators and characteristics complex was compared. It was established, that a little various set of passive and active safety systems in considered types of reactor installations provides necessary level of safety.</td>
</tr>
<tr>
<td>Coefficient of efficiency specified in the Report (above 96 %), is very high. What was the reason for the given assumption?</td>
<td>Section 6.1 The basic technical and economic characteristics of the APS - 2006</td>
</tr>
<tr>
<td>Can you present the description of passive system of injection of high pressure boron (project, drawing, operating characteristics)?</td>
<td>It is not the EIA subject (Addition II) The design documentation, the part of it is EIA, contains that information.</td>
</tr>
<tr>
<td>What is the thickness of the walls (cylinder and dome) of the double protective cover of PWR-1200 reactors? What are the characteristics of an air crash of the maximum force (weight of the plane, speed) which the reactor cover can sustain?</td>
<td>Section 6.8.2 System of sealed enclosure (containment)</td>
</tr>
<tr>
<td>Concerning external explosions. According to the Report, the maximum shock wave which the reactor cover can sustain seems to be quite low (10 kPa). On the other hand, higher figures are specified in the literature. Which of these figures are true? What is specified in the specifications in this particular case?</td>
<td>It is not the subject of EIA (Addition II) Such information is contained in the design documentation which integrated part is EIA.</td>
</tr>
<tr>
<td>Question</td>
<td>Section</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>How have the figures been received for the maximum loading at earthquake (measure of earthquake intensity, ground acceleration)?</td>
<td>It is not the subject of EIA (Addition II)</td>
</tr>
<tr>
<td></td>
<td>Such information is contained in the design documentation which integrated part is EIA. The specified figures are received during seismological and geological researches at the stage of choice of the platform of the APS</td>
</tr>
<tr>
<td>Can you present the device description of the fusion localization? Whether the tests of this device took place and if yes, what sort of tests? For example, what are the guarantees to avoid steam explosion? Can you present the description and characteristics of a passive system of bleeding from steam generators (design, drawing, operating characteristics)? What role does the given system play in terms of long-term passive removal of excess heat? Which other systems do exist for the given purpose? How has been their functioning reliability proved?</td>
<td>Section 6.8.1 System of melt localization</td>
</tr>
<tr>
<td>Do the figures on serious damage probability of the active zone and probability of maximum permissible discharge presented in the Report on water-moderated water-cooled power reactor-1200 cover all operative plant conditions (full capacity loading, low power operation and shutdown), as well as all initiating factors (internal and external)?</td>
<td>It is not the subject of EIA (Addition II)</td>
</tr>
<tr>
<td></td>
<td>That is the question of project on Safety Case Report of Belorussian APS</td>
</tr>
<tr>
<td>Unclear aspect is connected with event probability. In particular, whether 95 % quintile of probability of serious damages of the active zone and probability of maximum permissible discharge can be provided for?</td>
<td>It is not the subject of EIA (Addition II)</td>
</tr>
<tr>
<td></td>
<td>That is the question of project on Safety Case Report of Belorussian APS</td>
</tr>
<tr>
<td>The Report affirms that the Nuclear Power Plant-2006 installation meets the requirements of EUR. Can you the additional information on the given problem? In particular, on the source of discharge which, supposed, meets the requirements of «Criteria on the Limited Impact»?</td>
<td>Section 6.3 Information on expert decisions</td>
</tr>
<tr>
<td>Can you detail the requirements which are raised toward the nuclear installation (besides EUR)?</td>
<td>Section 6.7 Essential criteria and principles of safety</td>
</tr>
<tr>
<td>Where have the data on emission source characteristics presented in the Report been taken? Why are not more considerable figures of emissions being analyzed?</td>
<td>Section 14.5.3 Accidental releases</td>
</tr>
<tr>
<td>Question</td>
<td>Section</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>What emissions figures represent the most serious scenarios and what are the maximum permissible discharges?</td>
<td>Section 14.5.3 Accidental releases</td>
</tr>
<tr>
<td>Are the authors of the EIA Report aware of the results of preliminary reports on safety at the Leningradskaya NPS-2 and the Novovoronezhskaya NPS-2 (NPS-2006 (Water-moderated water-cooled power reactor-1200/491)) which are under construction?</td>
<td>Section 14.5.3 Accidental releases</td>
</tr>
<tr>
<td>What scenarios on the maximum design-basis accidents and out-of-design-basis accidents have been analyzed by the designers of the NPS?</td>
<td>Section 15 Forecast of trans-boundaring impact of Belorussian APS</td>
</tr>
<tr>
<td>Can you describe the measures on nuclear reactor accidents control and the particular measures which can provide for the least discharge in case of out-of-design-basis accident?</td>
<td>Section 11.2.2 Referential severe beyond design basis accident</td>
</tr>
<tr>
<td>What radioactivity levels do you use for radioactive waste classification (high, average, low)?</td>
<td>Section 7.5 Radioactive waste management</td>
</tr>
<tr>
<td>Are there any plans of intermediate warehouses construction for the spent fuel?</td>
<td>Section 8 Nuclear fuel management</td>
</tr>
<tr>
<td>Is construction of active nuclear waste utilization place in the Republic of Belarus planned?</td>
<td>Section 8 Nuclear fuel management</td>
</tr>
</tbody>
</table>
2.5 Lithuanian Republic

1 Вставить Ответ Литвы по консультациям 27.05 с 171
2 вставить Литва Позиция с.172-228
3 Протокол 3433
2.5.1 Replies on remarks and proposals of Ministry of Environment of the Lithuanian Republic

Question 1. EIA procedure according to the legislation of the Republic of Belarus is unconvincing. For understanding of a difference between different stages of the present procedure it is necessary to give the general idea about EIA procedure, informing and participation of the countries concerned and various stages of the present procedure.

Answer. EIA procedure is conducted in accordance with Regulation of Ministry of Natural Resources and Environmental of the Republic of Belarus of 17 June 2005 N 30 “Concerning Approval of the Instruction on assessment of environmental impact by planned economic and other activities in the Republic of Belarus and list of types and facilities used for economic and other activities for which the assessment of environmental impact by planned economic and other activity is conducted mandatory”.

According to the above mentioned procedure, EIA includes the following stages:
- the first stage - application preparation on intentions of planned activity implementation and drafting of the technical specifications on impact assessment making;
- the second stage – determination of types and environmental impact significance and after-effect forecasting;
- the third stage – making of notification on environmental potential impact;
- the fourth stage – holding of public hearing;
- the fifth stage - making and rendering of the report and other materials on impact assessment for ecological expertise.

Public hearings are held with following purposes:
- to exercise the public rights on participation in discussion and ecologically significant decisions making;
- to inform the public and other actors of impact assessment on planned activity;
- to detect remarks and proposals of all actors of impact assessment, alternative variants of project decisions realisation of planned activity;
- to come up with guidelines for further design stages and project decisions realisation of planned activity;
- to identify and record all potential effects of harmful interference on environment and population health;
- to search for mutually acceptable for customer and other actors impact assessment decision in avoiding and reduction of harmful interferences on environment by project decisions realization of planned activity;
- to correct decisions on design for planned activity or waive it.

Public hearings procedure includes the following steps:
- notification on public hearing;
- survey of the statement for potential impact on environment and other data;
- discussion of the statement on potential impact on environment and impact assessment with public (actually public hearings);
- making of the protocol of public hearings with the attachment of the remarks and proposals list which received from the public by holding of hearings, with a substantiation of their acceptance or rejection.

Notification on starting of hearing procedure can be arranged by the following:
- mass media publication of statement, briefly or with full details, on potential environmental impact of planned activity and other design proposals;
- issuing and circulation of information sheets and journals;
- direct notification by post distribution and (or) by e-mail and electronic information networks.

Question 2. Construction, operation and decommissioning of APS shall be carried out according to the highest safety standards. Requirements meeting of the present standards should be provided during all service life of installation. The legal platform for licensing stages during construction of the APS is not presented in EIA. The information on licensing procedure as parts of the final stages of the mentioned process, national requirements to it should be included in the report and role EIA should be explained.

Question 3. It is unclearly, how the Republic of Belarus will develop a national infrastructure before, during and after APS construction to provide due fulfilment of the following principles of the nuclear safety stated in publications SF-1 IAEA. During IAE it is necessary to pay careful attention on fulfilment of the following three principles:

1. The basic duty for safety should be assigned to the person or organisation, responsible for the equipment and activity which could cause the risks connected with radiation. Namely, how the organisation responsible for nuclear safety will be established, and how will be adequately estimated its ability to organise project development, construction and implementation of other actions, important for nuclear safety?

2. The efficient legal and state security structure, including independent regulating authority, should be established and be supported. Namely, will the Republic of Belarus develop the infrastructure necessary for training of qualified staff, technical support and independent estimations of nuclear safety according to IAEA recommendations?

3. The efficient management of safety should be established and supported in the organisations dealing with radiating risks, and the equipment and activity which can cause such risks. Namely, what standards for environment protection systems and management will be applied by the organisations, taking measures, important to safety of the new APS?

Replies on Questions 1-3. According to the Articles 6 and 7 of Law of the Republic of Belarus «On atomic energy use», the Emergency Situations Ministry exercises administration in the field of nuclear and radiating safety, and also is one of the authorised republic state bodies, exercising activity state regulation on safety control by atomic energy use.

Requirements to licensing procedure of the activity related to construction, operation and decommissioning of APS, are set out in the Decree project of the President of the Republic of Belarus «Concerning licensing of individual types of activity» that supposed to come into force from 1 July 2010.

The specified document establishes the activity licensing order in the field of atomic energy use, as well as defines licence requirements and conditions:

- the availability of technical equipment meeting requirements of regulatory and technical regulatory act in the field of atomic energy use, allowing performing the works qualitatively included in licensed activity;
- capability of design, engineering and technological solution to requirements of regulatory and technical regulatory act relating to use of atomic energy and ionising radiation sources;
the availability of acceptable regulatory and technical regulatory acts in the field of
atomic energy use, storage conditions of nuclear materials and radioactive substances,,
system of the account and control of such materials and substances, plans of actions on
workers protection in facility of atomic energy use and the population in case of accident
occurrence, as well as readiness to perform these plans of actions;
– the availability of documents, substantiated nuclear and radiating safety assurance,
acceptable to requirements of regulatory and technical regulatory acts in the field of
atomic energy use and ionising radiation sources;
– Ability to provide conditions for the safe termination of licensed activity and de-
commissioning of installation of atomic energy use, as well as availability of cor-
responding design materials and others

Emergency Situations Ministry as licensing body, within its competence, is ready to
control compliance of the legislation on licensing, licence requirements and terms by
licensed party in the order set out in Regulation “Concerning licensing of individual
types of activity» and other legal acts on control and supervising activity. It shall allow
providing compliance with the requirements of nuclear and radiating safety during all life
cycle of nuclear installation, particularly at constriction, operation and decommissioning
of APS stages.

According to the Decree of the President of the Republic of Belarus of 12 November,
2007 N 565 «On some measures on atomic power station construction» in the Republic
of Belarus the Department on nuclear and radiating safety of the Emergency Situations
Ministry of the Republic of Belarus (Gosatomnadzor) was established which primary
goals are the state supervision in the field of nuclear and radiating safety, the control
over legislation compliance by nuclear and radiating safety performance.

Scientific works support on atomic power station construction is imposed, by the
same Decree of the President of the Republic of Belarus, on the state scientific institu-
tion «Joint Institute for energy and nuclear research - Sosny» of the National Academy
of Sciences of Belarus (JIENR - Sosny).

Alongside this, according to governmental program «Scientific support of atomic en-
gineering development in the Republic of Belarus for 2009-2010 and for the period till
2020», adopted by the Resolution of the Council of Ministers of the Republic of Belarus
of, 28 August, 2009 N 1116, GNU «JIENR - Sosny» NAS Belarus, together with the in-
terested organisations performs the development of regulatory and legal framework for
control of safe nuclear power development in the Republic of Belarus.

Nowadays technical codes of the established practice, establishing the requirements
to APS placing, designing and operation, are adopted and operate:
– ТКР 097-2007 (02300) Essential criteria and requirements of safety control;
– ТКР 098-2007 (02250/02300) Basic requirements on structure and volume of in-
vestigations and researches by AS site and place selection;
– ТКР 099-2007 (02250/02300) Guidelines on development and substantiation
content of ecological safety of atomic station;
– ТКР 101-2007 (02230/02250/02300) The development order of the general pro-
gram of quality assurance for atomic;
– ТКР 102-2007 (02230/02250/02300) The development order of quality assur-
ance program by site selection for atomic station;
– ТКР 171-2009 (02300) Nuclear security rules of nuclear stations reactor installation
(ПБЯ РУ АС);
– ТКР 170-2009 (02300) General provisions of safety control of atomic stations
(ОПБ АС).
The experience, gathered in the former USSR and the Russian Federation, on construction and operation of nuclear power installations was considered by documents formulation, as well as the recommendations stated in safety requirements and guidelines of IAEA.

At present, technical regulatory legal acts «Requirements to the report content on the substantiation of safety of the APS with reactors of type WWER» and «Sanitary rules of designing and operation of atomic stations» are at the coordination stage.

Training of specialists in the republic is started according to the Governmental program of a professional training for nuclear power of the Republic of Belarus for 2008-2020, confirmed by the Resolution of the Council of ministers of 10 September 2008 N 1329. Program objective is organisation of synthetic professional training system providing literacy education and skills that are necessary for construction and safe operation of atomic power station, nuclear and radiation security assurance, safety of APS staff, population and environment.

Nowadays, the documents on appointment of operating organization are in development. Operating organization shall be appointed in 2010. The operating organization activity shall be estimated according to recommendations of IAEA documents and at intervals be checked by Gosatomnadzor of the EMERCOM of the Republic of Belarus and IAEA experts.

Thus the Decree of the President of the Republic of Belarus of 12 November 2007 N 565 «On some measures on atomic power station construction» established official body «Directorate on construction of atomic power station», which with a view of APS construction operate the following activities:
- The organisation and carrying out of research and survey works for industrial site selection;
  - organisation of design and estimate documentation developing;
- The organisation and coordination of construction-assembly and other works;
- Preparation of technical assignment and the documentation on purchase of the special and power equipment, works and services;
  - control over quality of works and their acceptance in spheres: nuclear technologies, geodesy, exploration, seismotectonic, ecological works, as well as participation in works for necessary project selection, the technological scheme, the equipment, safety systems and other connected with APS construction.

**Adverse for placing the AS is considered:**
- the areas, which seismicity is characterised by intensity MP3 above 7 points on scale MSK-64;
- Territories on which the modern differentiated movements of earth crust (vertical with a speed more than 10 mm per annum, horizontal - more than 50 mm per annum) are established;
  - Territories with saline soils and salinizations and desalinizations that are developing on them;
  - Territories with mountain and other abandoned headings;
- flood-plains terraces of the rivers and coast of water pond with moving speed of shearing and bank line of abrasion ledge more than 1 m per annum;
  -Slopes with a bias 15° and more;
- Sites where water in a water supply source has the high chemical and biological impurity exceeding prescribed specifications
  - The main catchment areas;
- The sites with ground waters on depth less than 3 m from a lay-out surface in grounds with capacity of 10 m and more with filtration coefficient of 10 m a day
and more, as well as with strong crumbling and bulk-mineable grounds with low sorption capacity;
– Habitat of structurally and dynamically unstable grounds, permafrost soils, as well as grounds with the module of deformation less than 20 MPa;
– The territories subject to influence of hurricanes and tornadoes;
– Territories inside which objects are located, including ammunition storage facilities, on which, at a fire and explosion, emissions of toxic substances and other influences exceeding the design are possible;
– territories on which as a result of planned in the long term industrial, hydroeconomic and household construction or development of irrigated agriculture inadmissible mode changes of underground and surface water s are possible, their temperature and surface structure.

Question 4. For a building area estimation three sites (Krasnaya Polyana, Kukshinovo, Ostrovets) have been chosen. The characteristics of these sites have been presented, but the substantiation why the Ostrovetsky site has been chosen as a priority are unsatisfactory, and it is necessary to present more detailed information on essential characteristics and factors (for example, it is necessary to present the explanation and more detailed information on possibility of activity of the processes of outflow and karst in tKrasnaya Polyana and Kukshinovo).

Question 5. Comparison of the alternative sites on the degree of fatal influences on environment should become a major factor in choosing a building area, hence, in the Report on EIA it is necessary to pay considerable attention to the given comparison. However in Chapter 4 of the Report rather detailed analysis of possible nuclear power plant environmental impact within 30 km zone only on the Ostrovetsky site has been presented. Also the Report does not contain the similar information on other potential sites and does not compare impact of sites on environment components.

RESPONSE: The detailed information on competitive sites (Krasnopolyanskaya, Kukshinovskaya and Ostrovetskaya) has been presented in a summary volume on a complex of research and prospecting works on choice of the site for placing of a Nuclear Power Plant in the Republic of Belarus (1588-PZ-OIZ the General Explanatory Note. Part I).

The choice of the site for placing of a nuclear object is the multifactor problem connected with taking into account the influence of environment on nuclear object and nuclear object impact on environment. Safety of the nuclear power plant, radiation safety of the population and environmental protection close to the nuclear power plant at normal operation and with regard to design and out-of-design accidents along with technology and organizational measures are being provided for by choice of a favorable site of the Nuclear Power Plant and its appropriate distance from settlements, industrial enterprises, objects of culture and public health services etc. Thus, at decision-making on suitability of the site for the Nuclear Power Plant, the following factors have been taken into consideration:

- Connected with impact of the nuclear power plant on environment and radiation safety of the population;
- Caused by the events and the influences connected with activity of the human being;
- Connected with environment impact on safety of the Nuclear Power Plant.
Criteria of Comparison

The choice of a priority site has been carried out on the basis of the analysis of the competitive sites by the chosen criteria of comparison, in the following vectors:

- Compliance with the requirements of the standard documents of the Republic of Belarus and the recommendations of the International Atomic Energy Agency;
- Natural and technogenic factors;
- Social and demographic factors;
- Ecological factors, including radiation pollution;
- Technical and economic factors.

The major factor for choice of the site was the criterion of safety.

Question 6. The population dose as distance and direction function should be counted and used as the mechanism on estimation of radiological risk.

Question 21. The useful way of demonstration of the corresponding influences on Belarus and the involved countries could be calculation of the population dose at normal operation in each state. Then it would be necessary to compare the given calculations with the corresponding advantages of the Belarusian Nuclear Power Plant in relation to each state.

According to Publication 103 of the International Committee on Radiological Protection it is not recommended to use collective doses at small values of individual doses for estimation of radiation risks.

The values of integral collective doses by sectors at normal operation of the nuclear power plant water-moderated water-cooled power reactor-1000 (nuclear power plants-92) (PWR-100) and nuclear power plant water-moderated water-cooled power reactor-640 (PWR-640) depending on population distribution within 30-km zone of the Ostrovetsky site are represented on pp.106-107 of the document «Report on Studying the Possibility of Placing of the Nuclear Power Plant in the Republic of Belarus. Complex of Works on Studying Hydrology, Radiology, Ecology, Land Tenure Conditions at Nuclear Power Plant Placing in Ostrovetsky and Verhnedvinsky Areas» drawn up by the Joint Institute for Nuclear Research - Sosny SSE of the National Academy of Sciences of Belarus.

Question 7. In EIA there are no data about air corridors close to the alternative sites of the Nuclear Power Plant, intensity of flights in these corridors and distance to the nearest civil and military aerodromes. It is very important to compare alternative sites on these criteria.

RESPONSE. At a stage of choice of the site for Nuclear Power Plant construction according to the requirements of the standard documents:

- TKP 098-2007 Placing of Nuclear Power Plants. The basic requirements on structure and volume of research and investigation for choice of a site for a Nuclear Power Plant;
TKP 097-2007 Placing of Nuclear Power Plants. The basic criteria and requirements on accident prevention.

The opinion letters have been received from the corresponding bodies of the State authorities. There have not been revealed the additional factors which forbid construction of the Nuclear Power Plant on the given sites.

**Question 8.** In Chapter 2.3.4 the positive characteristics of reactors PWR have been listed, but not all of them have been grounded. The information which shows that the doses from reactors PWR are minimum should be added. It is necessary to present some comments on all the characteristics.

**Question 9.** In Chapter 2.5 it has been underlined that the Russian Project for the Belarusian Nuclear Power Plant has been chosen after the all-round analysis of the industrial units of reactors. What characteristics and criteria were used and were important for the given selection? The results of the given analysis which have been made for selection should be presented in the Report of EIA.

**RESPONSE:** The choice of the type of the project of the Belarusian Nuclear Power Plant is defined on the basis of «the Opinion Letter of the Working Group on Preparation of Offers for Choice of the Design of the Nuclear Power Plant for Construction in the Territory of the Republic of Belarus dated April 6, 2009». The choice of the design of the Nuclear Power Plant, comparison of various types of the Nuclear Power Plants etc. is not the matter of EIA. EIA of the new Nuclear Power Plant in Lithuania contains the minimum volume of the technical information on the Nuclear Power Plant, more precisely, it is written irrespectively of the Nuclear Power Plant design. According to the requirements of the standard documents of the Republic of Belarus in the Report on EIA, it is necessary to present a general characteristic of the planned activity (the description of various types of nuclear power plants).

Concerning the minimum doses of irradiation in the areas of placing of the Nuclear Power Plant it is possible to add the statement of the First Deputy Director of the Institute of Problems of Safe Development of Nuclear-Power Engineering of the Russian Academy of Sciences Rafael Arutyunyan: «There are radiation-hygienic passports of the territories which are being issued annually by Rospotrebnadzor as the state supervising body - on all the areas, large cities, through Russia, and irrespective of presence or absence of the Nuclear Power Plant, of medicine, of natural background, of any objects: from hospitals, polyclinics to Nuclear Power Plants. These figures are being published annually under the signature of the Chief Sanitary Inspector of the country. Everything which can be seen there are obvious and official. Nothing is being changed in these passports for the last years when they began to deal with them seriously: population radiation exposure in view of discharges and emissions from Nuclear Power Plants are by 10 000 times lower than irradiation from a natural background or from medical intervention. I will remind that today it is necessary to have very up-to-date equipment in order to register the discharges from the Nuclear Power Plant, and any time it will be uneasy - to find traces. Because not figures which characterize emission are of importance but the doses being received by the person, - the expert has explained. - If the dose from a natural background is 1, well, 10 milliziverts (mSv) per year? That is by one thousand or by ten thousand times lower than irradiation from a natural background. The system of rigid specifications in our country is such that leads just to a panic, - Arutyunyan assured. - The Russian infringements of the limits, admissible values and levels are not being noticed abroad, as a rule. When in our country we say “the limit of irradiation for population”, for example, 1 mSv, from the point of view of influence of nuclear objects it is a question of figures by
one thousand times lower. The word "limit" itself and the term "the admissible limit" are being understood in public consciousness so, that if the person receives more then he will immediately die. This is not true. Here in Russia, for example, in the Republic of Altai, the natural background because of radon amounts to 10 mSv, in Finland - 7,5 mSv, in Belgium – 6 mSv. It is known that such radiation background does not render any influence on the person. In any case, there is a set of supervising bodies in Russia such as Rospotrebnadzor and Ministry of Natural Resources which independently supervise a background and publish the data in open access. Eventually, there is a website where in real time mode all values on the level of a natural background are being shown. Even if there are five values exceeded by five times, it does not matter for health (www.regnum.ru/news/1210953.html <http://www.regnum.ru/news/1210953.html> 19:40 01.10.2009)

Question 10. Figure 6 shows that tightness of a reactor can sustain plane wreck. But no quantitative (weight, rate of fall) or qualitative (plane type) characteristics of such influence have been presented. The Report on EIA should be added by indication characteristics.

RESPONSE: In the Nuclear Power Plant project - 2006 (SpbAEP) it is specified: a crash of airplane with weight of 5,7 tons with a speed of 100 m/s.

Question 11. In Table 12 it is written that effective time of recycling of the established power within a year is at least 8400 hours. On page 61 of the Report on EIA (the English version) it is written that calculation of the total amount of the formed slag in the course of operation of two blocks is based on calculation operation hours (6500 hours per year). Explain this difference or correct one of the presented values.

RESPONSE: The operation time on the rated power within a year (effective) amounts to 8400 hours for reactor plant B-491, the Nuclear Power Plant-2006 Project (SpbAEP). The value of the given parametre is being specified in the course of contract design working out. On page 56 (the Russian version) of the Statement it is specified that an estimated time of operation of chemical water purification for two blocks of the Nuclear Power Plant is 6500 hours per year. There are no any contradictions since the plants of chemical water purification operate as required.

Question 12. The information on transportation and fuel storage is not satisfactory. The presented documentation only specifies that the spent nuclear fuel will be transported by lots in the special transport packings. The information on safety of transportation of nuclear fuel (technical and administrative measures should be specified) and influence of this transportation on environment should be presented in detail.

RESPONSE: In EIA of the Belarusian Nuclear Power Plant, Chapter 8, the procedures of handling of the fresh and spent nuclear fuel in the territory of the site of the Nuclear Power Plant are presented. The issues outside of the Nuclear Power Plant site are not the matter of EIA.

Question 14. The Report does not contain the forecast of the volume and activity of liquid radioactive waste. It is necessary to add a quantitative estimation of liquid radioactive waste In the Report.

RESPONSE: At the Nuclear Power Plant decontamination of liquid radioactive substancies on evaporating plant with a capacity of 6 t/h is being provided for. As a result of processing of trapped waters the pure condensate is being formed being reused
in a cycle of the Nuclear Power Plant, and a concentrate of salts (vat residue) being LRW. The applied technologies provide for reuse in a cycle of the Nuclear Power Plant up to 95% of the trapped waters.

For intermediate storage and subsequent processing of LRW the following systems are provided for:

- The system of intermediate storage of vat residues and waste sorbents;
- The system of conditioning and hardening of liquid radioactive waste.

The system of intermediate storage of LRW provides for isolation of LRW for at least 3 months for the purpose of decrease of the level of radioactivity at the cost of decay of short-living radionuclides. At a final stage of radioactive waste burial there are no LRW at the Nuclear Power Plant.

Question 15. Table 15 shows «the Established Values of Cumulative Emissions» and "Actual Data" about the general cumulative emissions in atmosphere. Please, explain the term “the Established Value of Cumulative Emission”. Who has established the given value? In what document and on what terms the given value is presented? Please, explain, to which concrete plant with a reactor PWR-1000 Actual Data relate? How will they correspond to the data for the planned Nuclear Power Plant which has high power, and, probably, has another design, different equipment and technology?

RESPONSE: In Table 15 (Page 54 "Statements") the sources of chemical impact at the Nuclear Power Plant site are represented. The terms «Established Values of Cumulative Emission» and "Actual Data" about the general cumulative emissions in atmosphere are absent.

Question 17. In Section 3.1.5 as an example the effect of emissions of radionuclides in atmosphere from various Nuclear Power Plants is presented. If it is supposed that emissions from the Belarusian Nuclear Power Plant will be the same as are accepted in Russia, only percent of the levels of emissions of the permissible discharge (Table 23) is represented and the reference to the standard documents. Unfortunately, we do not have access to the documents specified in the Report, and at the same time to the possibility to find out the standard rates. Moreover, the standard rates in respect of emissions which operate in Belarus are not presented. The information on how the permissible discharge level in Belarus will be defined should be presented also.

Question 18. Table 23 shows that the same percent of radioactive substances of the authorized release level for various types of the Nuclear Power Plants corresponds to various absolute values of emissions. For example, 16% of radioactive substances of emissions of the New-Voronezh Nuclear Power Plant correspond to 110 TBq, for the Leningrad Nuclear Power Plant - 16% correspond to 597 TBq (more than by 5 times more). The similar divergence can be tracked also in respect of emissions I - 131, Co - 60, Cs - 134, Cs - 137. Explain, please, whether various annual permissible discharge levels for various types of reactors in the Russian Federation have been established? Whether the standard rates of radioactive substances established in the Russian Federation correspond to the International standards?

RESPONSE: According to the «Sanitary Rules of Designing and Exploitation of the Nuclear Power Plants (SP AS-03) of the Russian Federation» a quota on irradiation of...
the population for Nuclear Power Plants being projected and those under construction equal to 100 µSv/year for 50 µSv/year on each of the channels: gas-aerosol emission and discharge of liquid radioactive substances. On the basis of the annual quota of 50 µSv/year the permissible discharge level of radioactive gases and aerosols in atmosphere is being calculated (Table P.12).

Table P.12 – Annual Permissible Discharge Levels

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>NPP with High Power Pressure-tube Reactor (RBMK)</th>
<th>NPP with PWR and fast reactor</th>
<th>NPP with EGP-6 reactor (electrohydraulic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRG, TBq</td>
<td>3700</td>
<td>690</td>
<td>2000</td>
</tr>
<tr>
<td>Iodine-131, GBq</td>
<td>93</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Co – 60, GBq</td>
<td>2.5</td>
<td>7.4</td>
<td>7.4</td>
</tr>
<tr>
<td>Cs – 134, GBq</td>
<td>1.4</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Cs – 137, GBq</td>
<td>4.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

The given emissions relate to the Nuclear Power Plants as a whole and do not depend on quantity of power units on the Nuclear Power Plant site. The given standard rates are valid in Belarus and correspond to the international standards.

Difference in numerical values of emissions is natural, since emissions relate to different types of reactor plants (RBMK and PWR), and the values of authorized release for them are different.

Question 19. In Table 24 there is no information about radionuclide structure of liquid waste.

RESPONSE: Since the basic source of formation of intermediate LRW are the plants of chemical water purification, the radionuclide structure will be defined by the radioactive products of corrosion which are present at the coolant of the first contour: Iron-59, Cobalt-60, Chrome - 51 and Manganese-54.

Question 20. One of the tasks of EIA is estimation of the general influence on the population. Unfortunately, the important data are absent in the Report on EIA: the dose for the population in the course of normal exploitation has not been calculated. The detailed information on emissions from various reactors at the Nuclear Power Plants of Russia in water and atmosphere is presented, but the dose for the population caused by emissions from the Belarusian Nuclear Power Plant has been calculated neither for the Belarusian population, nor for the population of the involved countries. Estimation of radiological influence on the population in the course of normal operation of the new Nuclear Power Plant, supposing emissions of radionucleides, should be presented, and the information on the authorized levels of doses and restrictions should be presented and explained.

According to the Law on Radiation Safety of Population and Publication 103 of the International Commission on Radiological Protection the limit of the annual dose of radiation of the population should not exceed 1 mSv.

Quota of irradiation of the population for the Nuclear Power Plants being projected and those under construction amounts to 0,1mSv.

The actual dose of irradiation of the population at Nuclear Power Plant operation - 0,01 - 0,02 mSv/year.

**Question 21.** Modelling of radioactive pollution being spread in the course of normal operation has not been executed, and transboundary radiological influence of the Belarusian Nuclear Power Plant has not been analyzed.

**RESPONSE.** For the Belarusian Nuclear Power Plant the Russian project of the Nuclear Power Plant-2006 of the third generation with a water-moderated water-cooled reactor is approved. The given project corresponds to the modern International requirements on nuclear and radiation security. The criteria of safety and design limits of the Nuclear Power Plant-2006 are presented in points 2.5-2.6, also calculated values of the radiuses of a sanitary-protective zone (600m) and zone of planning of protective measures (<3000 m) also have been stated. In view of the above-mentioned the authors of EIA have not considered reasonable to model the processes of transfer of radioactive pollution in the course of normal operation mode of the Nuclear Power Plant.

**Question 22.** The scenario of the maximum accidents the reason of which is the project (MDBA) during summer season has been analyzed. The term MDBA has not been defined in the Report. It is not clear what type of failure has been analyzed, and what classes according to INES scale can be applied to it. Also it is not clear why the scenario of MDBA has not been analyzed during winter season. It is necessary to present more information on the initial term of a basis of designing and conservatism peculiar for the given initial term.

**RESPONSE:** The term MDBA (Maximum Design-Basis Accident) means the maximum design-basis accident. The maximum design-basis accident (MDBA) –is the design-basis accident with the most heavy consequences. All the modes of design-basis accidents can be divided into three groups:

1) Accidents with fission yield in containment;
2) Accidents with a leak from the first contour to the second;
3) Accidents with bypass of containment.

The most dangerous accidents from the first group from the point of view of a damage rate of the active zone are the modes «Instant jamming of the main circulating pump unit» and «the Mode of large break: pipeline breaking of the first contour with diameter of more than 100 mm, including Du 850» in which loss of sealing of 100 % of fuel elements in the active zone takes place. In other accidents of the first group additional loss of sealing of fuel elements does not take place. Therefore other modes of the first group should have less dangerous radiatiion consequences. Only accident with a small break of the coolant and failure of sprinkler systems can be the exception.

As the maximum design-basis accident the mode of large break has been considered: pipeline breaking of the first contour with diameter of more than 100 mm. The assumption about 100 % loss of sealing is accepted conservatively. As a result of break-
ing of the pipeline of the first contour the effluence of the coolant of the first contour takes place, and, as consequence, pressure increase in containment.

Maximum design-basis accident relates to design-basis accident (DBA) – these are the emergencies for which the plant has been developed as per the established design criteria and for which damage of fuel and emissions of radioactive materials will be limited within the established range. In case of the DBA the security systems and containment of the Nuclear Power Plant will limit the quantity of emissions of radioactive materials to the environment to such a level at which pollution of a ground surface and foodstuffs will be below the limits established by the technical standard legal acts (TSLA). The maximum radiation dose for the population in case of design-basis accident should not exceed 10 mSv. As per the International scale of nuclear events this is level 4 – the accident without significant risk outside of the site.

Question 23. In Chapter 5.1 it is necessary to present more detailed information of the initial term concerning the accident which is not connected with design study and conservatism inherent to this initial term. Just as about reliability of a computer code which was used for stimulation of a dispersion and deposits of radionuclides. The list and the results of the scenarios of accidents being analyzed should also be presented.

RESPONSE: According to the requirements of EUR, (Volume 2 Chapter 1 Safety Requirements (Part 1) in the Nuclear Power Plant project the issue of out-of-design (serious) accidents will be in detail considered. In the Nuclear Power Plant project the reasons and consequences of 4 types of out-of-project accidents will be analyzed in detail:
- The accident when in the volume of a protective cover of the first contour the coolant interferes. Though all the security systems operate in normal mode, and there are infringements in functioning of a protective cover;
- The accident with a simultaneous leak of the coolant of the first contour and failures of some systems of emergency cooling;
- The accident with de-energization of the plant and impossibility of activation of three emergency diesel engines of the security systems within the first day;
- The accident with a leakage of the coolant of the first contour to the second contour.

The results of the analysis of all three specified types of out-of-design accidents have shown that the out-of-design accident of the third type can lead to the most heavy consequences from the point of view of radiation damage. In this case in view of complete de-energization of the Nuclear Power Plant cooling of the active zone of a reactor seases. This leads to the serious damages of nuclear fuel, but the protective cover preserves its tightness. As per the established 7-level scale of the International Atomic Energy Agency such accident has the fifth level of severity. Namely in case of such an accident the maximum caesium 137 emission of all types of out-of-design accident occurs, and the total power of emission is approximately by 80 times more than in case of design-basis accident. Emission of radioactive substances during accident would proceed about 24 hours. The main objective of ensuring safety of the Nuclear Power Plant at out-of-design accident consists in achievement and maintenance of a safe condition of the Nuclear Power Plant (Servere Accident Safe State) at serious accident not later than in one week from the beginning of the accident. For this purpose it is necessary to perform the following conditions:

- The fragments of the active zone are in a firm phase, and their temperature is stable or decreases;
- The thermal emission of fragments of the active zone is being removed and transferred to a final absorber of heat. The configuration of fragments is such that neutron multiplication factor is much lower than 1;
- Pressure in the volume of a protective cover is so low that in case of loss of sealing of the protective cover the criterion of restriction of radiation consequences for the population is being satisfied;
- The fission yield in the volume of a protective cover has stopped.

For ensuring of integrity and tightness of a design of a protective cover at serious out-of-design accidents the Project provides for:

- prevention of early damage of the internal protective cover;
- prevention of late failure of a protective cover at the cost of the corresponding measures, such as:
  - ensuring of heat removal and localization of a melt in a trap, exception of direct influence of a melt on a protective cover, the base, concrete of a reactor mine;
  - prevention of accumulation of potentially dangerous concentration of hydrogen.

The initial events of the referential out-of-project accident are as follows:
- breaking of the main circulating pipeline Du 850 at reactor input with bilateral blowdown;
- loss of sources of an alternating current and, correspondingly, nonserviceability of all active security systems for the long period of more than 24 hours, failure of activation of all diesel-generators; emergency supply is being carried out from storage batteries.

The dynamics of development of the serious out-of-design accidents is represented in the Table P.13.

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break of the MCP Du 850 on reactor input. Loss of all the sources of alternating current.</td>
<td>0,0 s</td>
<td>Initial event</td>
</tr>
<tr>
<td>Shutdown of all reactor coolant pump units (RCPU). Deactivation of the system of make-up-blasting. Prohibition on activation of fast reducing steam dumping plant.</td>
<td>0,0 s</td>
<td>Application of failure: loss of all the sources of alternating current of the Nuclear Power Plant including all diesel-generators.</td>
</tr>
<tr>
<td>Actuation of emergency protection system</td>
<td>1,9 s</td>
<td>According to the fact of de-energization of the blocj with a delay of 1,9 s</td>
</tr>
<tr>
<td>Start of operation of accumulator-1 of emergency cooling system</td>
<td>8,0 s</td>
<td>Decrease of pressure of the first contour lower than 5,9 MPa</td>
</tr>
<tr>
<td>Activation of passive heat removal system</td>
<td>30,0 s</td>
<td>According to the fact of de-energization at the section of reliable supply with a delay of 30 s</td>
</tr>
<tr>
<td>Actuation of accumulator-2 of emergency cooling system</td>
<td>120,0 s</td>
<td>Decrease of pressure of the first contour up to 1,5 MPa and delay for turning of the system of accumulator-2</td>
</tr>
<tr>
<td>Loss of borated water supply from accumulator</td>
<td>144,0 s</td>
<td>Decrease of the level in tanks</td>
</tr>
<tr>
<td>Event</td>
<td>Time</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------</td>
<td>------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>mulator-1 of emergency cooling system</td>
<td></td>
<td>of accumulator of emergency cooling system to the mark 1,2 m</td>
</tr>
<tr>
<td>Beginning of steam condensation in pipe heater of a steam generator</td>
<td>3600,0s</td>
<td>Parameters of the second contour are lower than those of the first contour</td>
</tr>
<tr>
<td>Loss of borated water supply from accumulator-2</td>
<td>30,0 h</td>
<td>Borated water stock depletion</td>
</tr>
<tr>
<td>Beginning of generation of hydrogen in the core at the cost of oxidation reaction</td>
<td>44,6 h</td>
<td>T of fuel elements &gt; 1000 K</td>
</tr>
<tr>
<td>Decay of the core and beginning of inflow of destroyed materials of the active zone and vessel internals to the lower mixing chamber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting of support grid of the lower mixing chamber and inflow of the parts of the active zone to the reactor vessel bottom.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decay of the reactor vessel and start of escape of a melt to the melt isolator</td>
<td>52,0 h</td>
<td>T of the reactor vessel &gt; 1500 K</td>
</tr>
</tbody>
</table>

For the purpose of minimization of consequences of serious out-of-design accident for management of serious accident the following systems are being used:

- System of heat removal from bulb (sprinkler system);
- System of emergency and planned shut-down cooling of the first contour;
- The monitoring system of concentration and emergency removal of hydrogen;
- The system of trapping and cooling of the fused active zone out of a reactor.

For modelling of spread of radioactive pollution in the atmosphere at out-of-design accidents/MDBA depending on meteorological conditions the automated system of analysis and forecast of radiation conditions RECASS NT (FIAC of the Federal Hydrometeorology and Environmental Monitoring Service (Chief Administration of Typhoon Scientific and Production Association) has been used. The automated system RECASS NT has been received by the Republican Centre of Radiation Survey and Monitoring within the framework of implementation of the Program of the Union State «Perfection and Development of Uniform Technology of Receipt, Collection, Analysis and Forecast, Storage and Distribution of the Hydrometeorological Information and Data about Environment Pollution (the second stage) for years 2003-2006». RECASS NT has been introduced and have been successfully used many years in FIAC of the Federal Hydrometeorology and Environmental Monitoring Service, at the Russian Nuclear Power Plants - Leningadskaya, Volgodonskaya, Novovoronezhskaya, Kol’skaya, Beloyarskaya, Bilibinskaya, Smolenskaya, Beloyarskaya, Kalininskaya, Kurskaya as well as in the Republican Centre of Radiation Survey and Monitoring of the Department on Hydrometeorology of the Ministry for Protection of the Environment and Natural Resources of the Republic of Belarus.

**Question 24.** In the course of analysis of estimation of influence of the Nuclear Power Plant on environment in the transboundary context threat of serious accident and corresponding radiological pollution should be presented. On the ground of a direction of movement of air masses in the Report on EIA it has been stated that the part of Lithuania in case of the accident which is not connected
with design study will be polluted. More detailed information (illustrating, showing results) of a site of the polluted territories and the levels of the given pollution should be presented.

RESPONSE: Calculation of distribution of radioactive pollution at out-of-design accidents/MDBA has been carried out with use of the models of various spatial resolution. These are the models:

- mesoscale – up to 100 km (it was used for MDBA);
- Transboundary - ~ 10^3 km (it was used for out-of-design accident).

The models calculate the field of pollution density of the underlying surface as a result of the dry/damp sedimentation, the surface concentration integrated by time, and the field of surface concentration of radionuclides at concrete moments of time. The calculations come to the end when the cloud leaves the emission source at the maximum distance for model or when the stock of radioactive substance has decreased up to 1 E-14 from the initial stock. The scenarios of out-of-design accidents were characterised by the largest output of radionuclides outside the range of the active zone of a reactor and high density of pollution of soil. Two scenarios of out-of-design accident differed in weather conditions at the moment of the maximum concentration of radionuclides in the atmosphere which resulted in diametrically various character of sedimentation on ground surface:

- Scenario 1 was characterised by relatively low wind speed and moderately steady condition of atmosphere which defined sedimentation of a considerable quantity of radioactive substances (up to 20000 kBq·m^{-2} on a trace axis) at rather small space of the area (several thousand hectares);
- Scenario 2 was characterised by high speeds of air masses moving with moderate fluctuation which resulted in formation of great fields (many hundred thousand of hectares) of radioactive pollution with rather low surface activity (0.5-37 kBq·m^{-2}).

The results of modelling of radioactive pollution of the territory at out-of-design accidents in meteorological conditions of the warm period of the year.

For calculation of radioactive pollution under meteorological conditions of the summer period of the year 2 scenarios for out-of-design accidents (serious) have been considered.

Scenario 1 included the following parameters:

- Modelling period - 24 hours;
- Duration of emission - 1 hour;
- Emission structure - $^{131}$I, $^{137}$Cs;
- Dynamics of the top and bottom bounderies of emission - 21-25m;
- Effective diameter of the source – 3m;
- Rate of outlow 1,8 m/s,
- Superheating - 30 °C.

Emission of isotopes $^{131}$I - 1 E+14 Bq, $^{137}$Cs - 1 E+13 Bq (for LNPP-2).

Scenario 2 included the following parameters:

- Modelling period - 24 hours;
- Duration of emission - 1 hour;
- Emission structure - $^{131}$I, $^{137}$Cs;
- Dynamics of the top and bottom boundaries of emission - 21-25 m;
- Effective diameter of the source - 3 m;
- Rate of outflow 1,8 m/s;
- Superheating - 30°C;
- Emission parameters - an exit of isotopes $^{131}$I in volume of containment - 90 % in the form of aerosols, an exit $^{137}$Cs - 100 % in the form of aerosols.
  Emission of isotopes $^{131}$I - $3,1 \times 10^{15}$ Bq and $^{137}$Cs - $3,5 \times 10^{14}$ Bq.

Calculation of radioactive pollution of the territory has been carried out with use of the transboundary model. In case of transboundary pollution calculation of the area of zones of pollution took place (for various levels) penetrated in the territory of the neighbouring countries.

Northwest trace

*Meteorological situation*: The weather was defined by the western periphery of the extensive inactive anticyclone with the centre over the Voronezhskaya oblast. Mainly without deposits, only in the West of the Brestskaya oblast under influence of inactive atmospheric front short-term rains have passed. The South-East moderate breeze. At meteorological station Lyntupy the following parameters have been fixed by the beginning of the accident:

- Temperature of air 4,2 °C;
- Wind direction - 120 °;
- Southeast, 1 m/s;
- Pressure 995,7 hPa;
- Dew point 1,7 °C;
- General cloudiness 0%
- Stability category – F

At meteorological station Vilnius the following parameters have been fixed:

- Temperature of air 5,5 °C;
- Wind direction - 130 °;
- Southeast, 1 m/s;
- Pressure 1001,1 hPa;
- Dew point 4,3 °C;
- General cloudiness 0%
- Stability category – F

The deposits have not been fixed.

The modelling has been executed with use of the data of prognostic fields of meteorological parameters from the Moscow Prognostic Centre under the following conditions:

- Southerly wind at a height of 10 m – 20-28 km/h
- Temperature at a height of 2 m above the ground – 6,0 – 7,2 °C

The height of agitation layer amounted to 0,4 km. The Smith stability category – 4.

The density of pollution of the territory $^{131}$I and $^{137}$Cs on the a trace axis is represented in the Table P.14 and in the drawing.
Table P.14 - Density of Pollution of the Territory with Radionuclides on the Trace Axis C3, Bq/m²

<table>
<thead>
<tr>
<th>R/n Bq/m²</th>
<th>Distance, km</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-131</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cs-137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario 1

| I-131 | 4.0E+04 | 5.3E+04 | 8.0E+04 | 1.2E+05 | 8.9E+04 | 1.7E+05 | 1.0E+05 | 6.9E+04 | 6.0E+04 | 5.4E+04 |
| Cs-137 | 4.3E+03 | 5.7E+03 | 8.6E+03 | 1.3E+04 | 9.7E+03 | 1.8E+04 | 1.1E+04 | 7.5E+03 | 6.5E+03 | 5.8E+03 |

Scenario 2

| I-131 | 9.7E+05 | 1.3E+06 | 2.1E+06 | 2.7E+06 | 2.3E+06 | 5.0E+06 | 2.9E+06 | 2.1E+06 | 1.7E+06 | 1.7E+06 |
| Cs-137 | 1.2E+05 | 1.6E+05 | 2.6E+05 | 3.5E+05 | 2.9E+05 | 6.0E+05 | 3.7E+05 | 2.6E+05 | 2.2E+05 | 1.9E+05 |

Fig. P.6 - Drawing of Scenario 1. Fields of Density of Pollution of the Territory.
Densitiy of pollution of the territory with iodine -131
Densitiy of pollution of the territory with cesium -137

Question 25. The results of calculations of pollution in the Republic of Lithuania in case of the accident which was not connected with design study, taking into account South-West emissions, also should be presented. Nevertheless, it is necessary to prove that conservative initial conditions are being taken into consideration (wind speed, wind direction etc.). The pollution and doses in Vilnius zone should be presented also with regard to conservative initial conditions.

Question 27. It is not clear how the doses for the population as a result of the emergency accident connected with design study and the accident which has not been connected with design study have been calculated. Which models for calculation of influence on the population have been used. More background information should be presented about estimation of a radiological dose and conservatism inherent for such estimations.

RESPONSE: Calculation of activity of radionuclides at emergency emission and the doses of irradiation of the population has been carried out with use of package InterRAS (The International Radiological Assessment System) which is intended for use by the experts who are carrying out estimations of radiological accidents.

The package has been developed on the basis of the program U.S. NRC’s RASCAL (Radiological Assessment Consequences Analises) and is based on the document “The International Basic Norms of Safety for Protection against Ionising Radiation and Safety of Radiation Sources”.

The model of the EMISSION SOURCE - the DOSE (ST-DOSE - Source Term To Dose) was used which estimates the integrated doses being formed as a result of emergency emission of radionuclides in the atmosphere. The model allows to estimate the consequences of potential emission or that occurring at the moment with use of a number of assumptions and background data concerning the state of the NPP, meteo-conditions, environment conditions.

In calculations certain assumptions have been used which allowed to receive scientifically proved top levels of doses of irradiation of the population as a result of possible accident at the BelNPP.

Emission of radionuclides in environment at the cost of leak through thinnesses of containment has been calculated for 24 hours.

Surface emission has been chosen since in case of surface emission higher levels of doses at considerable distance from the source of emission will be formed.

For modelling of transfer of radionuclides in the atmosphere the worst scenarios of possible actual meteoconditions have been chosen, i.e. scenarios at which the doses of irradiation of the population will be maximum.

Both for the maximum design-basis accident and for out-of-design accident the following doses of irradiation being formed during an early stage of the accident have been calculated:

- The general effective dose \( E_t \) which is being formed of the following components: an effective semicentennial dose from inhalation, a dose in view of irradiation from a cloud and a dose generated within seven days from fall-out;
- A dose of irradiation of a thyroid gland ($D_{tg}$) from inhalation receipt of radionuclides which represents a dose of irradiation of a thyroid gland of the adult person in case of execution of easy activity by him;
- A dose of irradiation from a cloud ($D_{CS}$) being formed in view of external irradiation from a passing cloud;
- A dose from fall-outs ($D_{GS}$) being formed in view of external irradiation from fall-outs within seven days;
- The effective dose from inhalation receipt of radionuclides ($D_{inhal}$) which represents a semicentennial effective dose of irradiation of the adult person in view of inhalation of radionuclides.

By means of model InterRAS calculation of the values of the above-stated doses of irradiation for the population living at a distance up to 50 km from the source of emission has been carried out.

Irradiation doses have been calculated: of the initial stage of the accident (for 24 hours, 1-st month, 2-nd month) being formed at the cost of the external irradiation from fall-outs and the internal irradiation in view of inhalation receipt of radionuclides at secondary dust formation, and long-term doses (during 50 years).

At calculation of the doses of irradiation the factors which influence on their reduction (staying indoors) have not been taken into consideration, i.e. the conservative estimation has been carried out. Actually, the doses of irradiation of the population will be much lower as compared with the calculated doses.

**Question 26.** The given information underlines that the risks for Vilnius will exist as a result of soil pollution, which activity will be by 1000 times higher than a natural background. Comparison of emergency maximum design-based emission of radionuclides from the New-Voronezhskaya Nuclear Power Plant-2 and the new Nuclear Power Plant in Belarus is not the reason for the statement that pollution of the territory of Lithuania with radionuclides of the long-term decay after maximum emergency emission at the Belarusian Nuclear Power Plant will be absent. The conclusion has not been proved with congruency. More detailed analysis for authentic substantiation is required.

**RESPONSE:** As the basic quantitative criteria characterising the level of safety the values of probabilities of serious damage of an active zone and maximum permissible emergency emission of the basic dose-forming radionuclides in environment at serious out-of-design accidents are being used (surfactant species).

1. Probability targets being established by the exploiting organisation for the power unit of the Nuclear Power Plant-2006 (the Nuclear Power Plant-2006. The requirements specification on development of the basic project. Year 2006):
   - Decrease in probabilities of accidents on the power unit with serious damage of the active zone of a reactor to level $10^{-6}$ 1/year reactors and great emissions outside the limits of the site for which more fast counter-measures out of the site are necessary, with a level $10^{-7}$ 1/year reactor;
   - Restriction of surfactant species of the basic dose-forming radionuclides in environment at serious out-of-design accidents with probability of $10^{-7}$ 1/year reactor level of 100 TBq of caesium-137.
   - Decrease of surfactant species of the basic dose-forming nuclides in environment at serious out-of-design accidents with probability of $10^{-7}$ 1/year reactor to the level at which:
      - Necessity of introduction of the immediate measures including both obligatory evacuation and long-term resettlement of the population outside the territory of the site.
is excluded; the nominal radius of a zone of planning of obligatory evacuation of the population does not exceed 800 m from reactor block;

- Obligatory introduction of protective measures for the population (shelter, iodine prevention) is limited by a zone no more than 3 km from the block.

The dose limits established for the Nuclear Power Plant-2006 power block and probability targets completely meet the requirements of the valid Russian normative documents, the recommendations and the norms of safety of IAEA, the International Consultative Group on Nuclear Safety (INSAG1 - INSAG12) and to the requirements of the European Exploiting Organisations to the Projects of Nuclear Power Plants of the New Generation with Reactors of type PWR (Safety requirements EUR. Version S, Edition 10, April of 2001). In the Table P.15 the targets of radiation and nuclear safety of power blocks of the increased safety for various projects of the Nuclear Power Plants and the requirement to them have been presented for comparison.

### Table P.15 – Indices of Radiation and Nuclear Safety of Nuclear Power Plants

<table>
<thead>
<tr>
<th>Criterion</th>
<th>EUR INSAG-3</th>
<th>Normative Documents of RF (SP AS-03)</th>
<th>Project of NPP-2006</th>
<th>Project USA-APWR DCD. 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quotas of irradiation of the population from emission (discharges) at normal operation of the NPP, μSv/year</td>
<td>Is not being regulated</td>
<td>50(50)</td>
<td>10(10)</td>
<td>-</td>
</tr>
<tr>
<td>Quotas of irradiation of the population from emission and discharges at normal operation with regard to field trouble of the NPP, mSv/year</td>
<td>100</td>
<td>Is not being regulated</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Effective dose for the population at design-basis accidents, mSv/event</td>
<td>1</td>
<td>Is not being regulated</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>- with frequency of more than $10^{-4}$ 1/year</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>- with frequency of less than $10^{-4}$ 1/year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective dose for the population at design-basis accidents, mSv/year</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Possibility of serious break of the active zone, 1/year.reactor</td>
<td>1E-5</td>
<td>1E-5</td>
<td>1E-6</td>
<td>1E-6</td>
</tr>
<tr>
<td>Possibility of great emissions for which fast countermeasures outside the site are necessary, 1/year.reactor</td>
<td>1E-6</td>
<td>1E-7</td>
<td>1E-7</td>
<td>1E-7</td>
</tr>
</tbody>
</table>

Toughening of safety requirements for the new blocks (USA-APWR, EPR, NPP-2006, etc.) has demanded working out of such additional technical decisions which have reliably limited the sphere of carrying out of the actions of extreme character to the most nearest vicinities from the Nuclear Power Plant. Thus in the project of the Nuclear Power Plant-2006 for further softening of the consequences of serious accidents two new passive systems of safety have been introduced: SPOT GO which reliably proves
for preservation of function of the protective cover at serious accidents, and SPOT PG which provides for cooling of the active zone of a reactor at complete de-energization of the block.

The surfactant species have been installed in the project of NPP-2006 taking into account the achieved level of safety for serious accidents class on the block (Preliminary Report on Justification of Safety of the Leningradskaya NPP-2, Chapter 15. Analysis of Accidents. Book 7 FSUE "SpbAEp", 2007):

- for early phase of the accident connected with leakage of fission products through loosiness of double containment and bypass of containment, in case of lack of power supply on the block: xenon-133-10^6 TBq; iodine-131-50TBq; cesium-137-5TBq.

- for intermediate phase of the accident after restoration of power supply on the block connected with emissions through ventilation pipe: xenon -133-10^5 TBq; iodine-131 – 50 TBq; cesium-137 – 5TBq.

2. For working out of surfactant species the analysis of radiation consequences of reference scenario of serious accidents connected with slow increase of pressure in containment (total probability of order 10^-7 1/year.reactor) according to the recommendations of IAEA for the Nuclear Power Plant with PWR (A simplified approach to estimating reference source terms for LWR design is made. IAEA-TECDOC-1127). In the Table P.16 below the design values of surfactant species and the requirements to them established in various countries and projects have been stated for comparison. Implementation of the planned strategy in the projects has lowered the design levels of surfactant species justified according to the requirements specified above.

**Table P.16 – Maximum Permissible Values of Accident Emissions and Requirements to Them, TBq**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Xenon-133</td>
<td>Is not being regulated</td>
<td>Is not being regulated</td>
<td>10^6</td>
<td>10^5</td>
<td>3.10</td>
</tr>
<tr>
<td>Iodine-131</td>
<td>Maximum 1000</td>
<td>Is not being regulated</td>
<td>600</td>
<td>100</td>
<td>349</td>
</tr>
<tr>
<td>Cesium-137</td>
<td>Maximum 100</td>
<td>Maximum 100</td>
<td>50</td>
<td>10</td>
<td>5,6</td>
</tr>
<tr>
<td>Strontium-90</td>
<td>Is not being regulated</td>
<td>Is not being regulated</td>
<td>1</td>
<td>0,12</td>
<td>0,15</td>
</tr>
</tbody>
</table>

1) The requirement is excluded at reedition of the document. By the document of PNAEG-03-33-93, HP-032-01 the requirements of the Russian normative documents have been harmonized with the requirements of IAEA (INSAG-3): measures on control and weakening of the consequences of serious accidents should decrease possibility of great emissions outside the site for which fast countermeasures outside the site are necessary, by level 10^-7 1/year.reactor.
In RESPONSE to Question 24 in the Table the design values of density of pollution of the territory at surfactant species $^{131}$I - 3,1 E+15 Bq and $^{137}$Cs - 3,5 E+14 Bq are cited which exceeds the recommended surfactant species of NPP-2006 by 31 times for $^{131}$I and by 35 times for $^{137}$Cs. At this emission the density of pollution of the territory at a distance of 30 km from the NPP is equal to 190 kBm/m$^2$ (5,1 Ki/km$^2$). Taking into account the linear character of relationship «activity of emission - pollution density», it is possible to tell confidently that the density of pollution in case of surfactant species of NPP-2006 at a distance of 30 km will not exceed 5,4 kBm/m$^2$ (0,15 Ki/km$^2$).

**Question 28.** Maximum doses at the accidents which are not connected with design study have been calculated, but anywhere in the Report on EIA has not been specified that the risks are admissible. In case if the graphic information on distribution of the doses among the population is presented, it is necessary to present the analysis of the given results and conclusions. Also it is not clear on which directions of movement of air masses the calculations are based. The estimation of Lithuania should be conservative, and the worst scenario should be considered.

**RESPONSE:** the analysis of the doses of irradiation has shown that against the background of decrease of the general effective dose with a distance contribution of an inhalation component of the dose decreases with moving away from the emission source while contributions of the doses from a cloud and discharges increases.

**Fig. P.7 - Drawing – Change of the Total Effective Dose of Irradiation with a Distance from the Source of Emission**

Общая эффективная доза, мЗв ,
Расстояние, км
Total effective dose, mSv,
Distance, km
Fig. P.8 - Drawing – Contribution of Various Doses of Irradiation to the Total Dose with a Distance

Доза облучения, мЗв, Расстояние, км

Dose of irradiation, mSv, Distance, km

Contributions from various ways of formation to a total dose at a distance up to five km are the following: inhalation - about 50 %; soil - about 40 %; cloud – up to 10 %. From 25 km the contribution to a total dose through inhalation decreases up to 40 %, and the contribution of irradiation from a cloud and from discharges increases up to 17 % and 44 % accordingly.

The above-mentioned analysis of contribution of radionuclides through different ways to the supposed effective dose has been carried out for the situations with various meteo conditions, and in each concrete case contribution of various componenets will be different.

The analysis of the doses of irradiation has shown that the total effective dose will not exceed the criteria of interference in any of the given scenarios of out-of-design accident (100 mSv for the whole body). Execution of the countermeasures in kind of shelter, decontamination and/or evacuation of the population is not required.

The maximum rated dose of irradiation of thyroid gland with the given scenarios of out-of-design accident will exceed the criterion of interference of 50 mSv for the first seven days after the accident at a distance up to 25 km from the Nuclear Power Plant. Thus, within the radius of 25 km from the Nuclear Power Plant execution of iodine prevention at early stage of the accident will be the required countermeasure.

The results of modelling by means of the International models definitely show that:

- it is not required to provide for shelter and/or evacuation of the population;
- it is necessary to ensure the possibility of effective execution of blockage of a thyroid gland in the territory up to 25 km from the Nuclear Power Plant;
- the possibility of introduction of restriction on consumption of potentially contaminated with radionuclides milk and other foodstuffs should be provided for;
- it is necessary to ensure the possibility of fast monitoring of environment, foodstuffs and animal food at a distance of at least 30 km from the Nuclear Power Plant.
Question 29. In Chapter 5.2.4. influence of tritium and other radionuclides on Neris River (Viliya) in the territory of Lithuania should be estimated.

RESPONSE. Around the Belarusian Nuclear Power Plant measurements of tritium and carbon - 14 have not been carried out. For qualitative estimation let us take advantage of the data from the Report on EIA of the new Nuclear Power Plant in Lithuania. Regular supervision of tritium in Drukshai Lake water have begun since 1984. The maximum value of activity of tritium has been fixed in 2003 and achieved 24 Bq/l. It has been experimentally established that influence of tritium on the person is rather low since the effective dose for the population caused by tritium is lower than 0,02 µSv/year. As for the basic nuclides of iodine-131 and cesium-137, the calculations show that with surfactant species $^{131}$I - 3,1E+15 Bq and $^{137}$Cs - 3,5 E+14 Bq the maximum forecasted concentrations in transboundary range line in case of out-of-design accident will have the following values.

Table P.16 – Result of Calculation of the Time of Spread and Maximum Concentrations of Radionuclides in Viliya River

<table>
<thead>
<tr>
<th>Water content variant</th>
<th>Time of lag of radionuclides front to a range line of 1,1 km from the boundary, hours</th>
<th>Maximum concentration in trans-boundary range line of 1,1 km from the boundary, kBq/m$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$^{90}$Sr</td>
</tr>
<tr>
<td>5 % provision</td>
<td>4,56</td>
<td>0,3</td>
</tr>
<tr>
<td>50 % provision</td>
<td>10,2</td>
<td>0,76</td>
</tr>
<tr>
<td>95 % provision</td>
<td>13,2</td>
<td>1,48</td>
</tr>
</tbody>
</table>

The given values do not exceed the values of the level of interference at consumption with a water for the population, stated in Radiation Standards-2000:) on $^{90}$Sr - 5 kBq/m$^3$, $^{137}$Cs – 11 kBq/m$^3$, $^{131}$I - 6,3 kBq/m$^3$.

Question 30. The estimation and the conclusion about transboundary influence on health of the population of Lithuania have not been presented, and there is some doubt whether this influence will be insignificant.

RESPONSE: The heaviest considered out-of-design accident is characterised by the following parameters:

Table P.17 - Meteorological Conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind direction</td>
<td>Western with transfer to south-west</td>
</tr>
<tr>
<td>Wind speed</td>
<td>5,5 - 11 m/s</td>
</tr>
<tr>
<td>Pressure</td>
<td>1008,0 hPa</td>
</tr>
</tbody>
</table>
Air temperature
-2.5 - -1.5 °C at night and in the morning, 3.7-1.8 °C – at day time and in the evening

Cloudiness 0 %

Height of hashing layer 1.2 - 1.5 km at night, 0.5 - 0.3 km at day time and in the evening

Category of atmosphere stability F

Precipitation intensity from 1 to 4 mm/h

Snow cover Snow cover with a height from 1 to 15 cm

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Activity, Bq</th>
<th>Radionuclide</th>
<th>Activity, Bq</th>
<th>Radionuclide</th>
<th>Activity, Bq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kr-85</td>
<td>1.00E+13</td>
<td>Kr-85m</td>
<td>4.2E+14</td>
<td>Kr-87</td>
<td>8.4E+14</td>
</tr>
<tr>
<td>Kr-88</td>
<td>1.2E+15</td>
<td>Sr-89</td>
<td>3.9E+13</td>
<td>Sr-90</td>
<td>1.5E+12</td>
</tr>
<tr>
<td>Sr-91</td>
<td>4.60E+13</td>
<td>Y-91</td>
<td>3.30E+12</td>
<td>Mo-99</td>
<td>1.80E+13</td>
</tr>
<tr>
<td>Tc-99m</td>
<td>1.80E+13</td>
<td>Ru-103</td>
<td>1.20E+13</td>
<td>Ru-106</td>
<td>2.70E+12</td>
</tr>
<tr>
<td>Sb-127</td>
<td>1.2E+13</td>
<td>Sb-129</td>
<td>6.9E+13</td>
<td>Te-129m</td>
<td>1.1E+13</td>
</tr>
<tr>
<td>Te-131m</td>
<td>2.5E+13</td>
<td>Te-132</td>
<td>2.5E+14</td>
<td>I-131</td>
<td>4.1E+14</td>
</tr>
<tr>
<td>I-132</td>
<td>5.8E+14</td>
<td>I-133</td>
<td>8.3E+14</td>
<td>I-134</td>
<td>9.2E+14</td>
</tr>
<tr>
<td>I-135</td>
<td>7.3E+14</td>
<td>Xe-131m</td>
<td>1.7E+13</td>
<td>Xe-133</td>
<td>3.0E+15</td>
</tr>
<tr>
<td>Xe-133m</td>
<td>1.1E+14</td>
<td>Xe-135</td>
<td>5.8E+14</td>
<td>Xe-138</td>
<td>3.0E+15</td>
</tr>
<tr>
<td>Cs-134</td>
<td>2.6E+13</td>
<td>Cs-136</td>
<td>1.0E+13</td>
<td>Cs-137</td>
<td>1.70E+13</td>
</tr>
<tr>
<td>Ba-140</td>
<td>8.8E+13</td>
<td>La-140</td>
<td>4.40E+12</td>
<td>Ce-144</td>
<td>1.2E+13</td>
</tr>
<tr>
<td>Np-239</td>
<td>2.3E+14</td>
<td>Rb-88</td>
<td>1.2E+15</td>
<td>Rh-106</td>
<td>2.7E+12</td>
</tr>
<tr>
<td>Te-129</td>
<td>1.10E+13</td>
<td>Xe-135m</td>
<td>1.2E+14</td>
<td>Ba-137m</td>
<td>1.70E+13</td>
</tr>
<tr>
<td>Pr-144</td>
<td>1.2E+13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The total activity of emission amounted to 1.50×10^{16} Bq for all the scenarios of out-of-design accidents. The doses of irradiation at the given scenario of the accident are as follows:

<table>
<thead>
<tr>
<th>Scenario 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance, km</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>25</td>
</tr>
</tbody>
</table>
**Fig. P.9** - Drawing – Total Effective Dose in the Near-field Zone of the NPP, mSv

*Ticks every 30 degrees
Отмечены каждые 30 градусов*

**Fig. P.10** - Drawing – Total Effective Dose in Far-field Zone of the NPP, mSv
Fig. P.11 - Drawing – Dose of Irradiation of Thyroid Gland in the Near-field Zone of the NPP, mSv (mGy)
Ticks every 30 degrees
Отмечены каждые 30 градусов

Fig. P.12 - Drawing – Dose of Irradiation of Thyroid Gland in the Near-field Zone of the NPP, mSv (mGy)
Probability of the given wind direction.
Table P.20 – Repeatability, %, Wind Direction

<table>
<thead>
<tr>
<th>Month</th>
<th>S</th>
<th>SE</th>
<th>E</th>
<th>SE</th>
<th>S</th>
<th>SW</th>
<th>W</th>
<th>SW</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>5</td>
<td>10</td>
<td>8</td>
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<td>25</td>
<td>16</td>
<td>8</td>
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<tr>
<td>II</td>
<td>7</td>
<td>13</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>20</td>
<td>16</td>
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<tr>
<td>III</td>
<td>6</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>16</td>
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<td>IV</td>
<td>10</td>
<td>15</td>
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<td>11</td>
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<td>V</td>
<td>13</td>
<td>18</td>
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<td>9</td>
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<tr>
<td>VI</td>
<td>13</td>
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<tr>
<td>VII</td>
<td>11</td>
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<td>22</td>
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<tr>
<td>VIII</td>
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<td>7</td>
<td>12</td>
<td>20</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>IX</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>15</td>
<td>24</td>
<td>19</td>
<td>9</td>
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<tr>
<td>X</td>
<td>6</td>
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<td>8</td>
<td>11</td>
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<td>17</td>
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<tr>
<td>XI</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>13</td>
<td>22</td>
<td>25</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>XII</td>
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<td>10</td>
<td>19</td>
<td>27</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Winter</td>
<td>6</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>18</td>
<td>24</td>
<td>17</td>
<td>7</td>
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<tr>
<td>Spring</td>
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<td>15</td>
<td>14</td>
<td>11</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Summer</td>
<td>11</td>
<td>13</td>
<td>7</td>
<td>6</td>
<td>11</td>
<td>18</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Autumn</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>11</td>
<td>19</td>
<td>25</td>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>Year</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>9</td>
<td>15</td>
<td>21</td>
<td>17</td>
<td>10</td>
</tr>
</tbody>
</table>

If the wind direction changes for East-North-East (direction to Vilnius) on conditions that all other parameters of out-of-design accident will be preserved, the doses of irradiation of the population will remain the same. The offered measures on reaction to the emergency can be also applied since they are based on the recommendations of the International documents.

**QUESTION 31.** According to IAEA-TECDOC-953, «Methods for Working Out of the Measures on Reaction to Nuclear and Radiological Accidents» the proposed radius of zone for planned urgent protective action amounts to 25 km while in the Report on EIA 20 km are stated. The substantiation of a choice of the given value should be presented.

**RESPONSE.** The International standard documents mark out the following zones of emergency planning of the measures on protection of the population and their sizes:

- **Zone of precautionary protective measures (3 - 5 km)** - a zone round the Nuclear Power Plant in relation of which the measures for implementation of urgent protective actions in case of a nuclear emergency for the purpose of decrease of the risk of occurrence of the heavy determined effects outside of the site are being carried out. The protective measures within this zone should be undertaken prior or soon after emission of a radioactive material or irradiation on the basis of the conditions created at the Nuclear Power Plant.
- **Zone of urgent protective measures (25 km)** - a zone around the Nuclear Power Plant in relation of which the actions directed on implementation of urgent protective measures in case of a nuclear emergency for the purpose of prevention of stochastic...
effects in that degree in what it is practically workable are being carried out, by prevention of the doses according to the International documents. The protective measures within this zone should be carried out on the basis of monitoring of environment or in appropriate cases with regard to the conditions created at the nuclear power plant.

Zone of restriction of consumption of foodstuffs (300 km) - a zone round the Nuclear Power Plant in relation of which the actions directed on implementation of counter-measures (for example, agricultural) which interfere oral intake of radionuclides with water and foodstuffs of local production, and long-term protective measures for the purpose of prevention of the great collective doses of irradiation in that degree in which it is practically workable, by prevention of the doses according to the International documents are being carried out. The protective measures within this zone should be carried out on the basis of monitoring of environment and foodstuffs.

Question 32. In Chapter 5.4.1 of the Report it is specified, that the long-term protective measures based on monitoring of environment and foodstuffs should be carried out within a 300-km zone round the Nuclear Power Plant. If Ostrovets will be chosen as the site for the Nuclear Power Plant, the 300-km zone will cover a considerable territory of Lithuania. In Chapter 7 of the Report the offered ways of organisation of monitoring have been presented only for the territory of Belarus. The Report does not address to a problem on protective measures and monitoring in the neighbouring territory of Lithuania.

RESPONSE: The International standard documents mark out the following zones of emergency planning of the measures on protection of the population and their sizes:

- Zone of precautionary protective measures (3 - 5 km) - a zone round the Nuclear Power Plant in relation of which the measures for implementation of urgent protective actions in case of a nuclear emergency for the purpose of decrease of the risk of occurrence of the heavy determined effects outside of the site are being carried out. The protective measures within this zone should be undertaken prior or soon after emission of a radioactive material or irradiation on the basis of the conditions created at the Nuclear Power Plant.

- Zone of urgent protective measures (25 km) - a zone around the Nuclear Power Plant in relation of which the actions directed on implementation of urgent protective measures in case of a nuclear emergency for the purpose of prevention of stochastic effects in that degree in what it is practically workable are being carried out, by prevention of the doses according to the International documents. The protective measures within this zone should be carried out on the basis of monitoring of environment or in appropriate cases with regard to the conditions created at the Nuclear Power Plant.

- Zone of restriction of consumption of foodstuffs (300 km) - a zone round the Nuclear Power Plant, in relation of which the actions directed on implementation of counter-measures (for example, agricultural) which interfere oral intake of radionuclides with water and foodstuffs of local production, and long-term protective measures for the purpose of prevention of the great collective doses of irradiation in that degree in which it is practically workable, by prevention of the doses according to the International documents are being carried out. The protective measures within this zone should be carried out on the basis of monitoring of environment and foodstuffs.

In EIA of the Belarusian Nuclear Power Plant the proposals on organization of ecological monitoring in a zone of supervision of the Nuclear Power Plant have been presented. At the given stage as a supervision zone the territory with radius of 30 km round the Nuclear Power Plant is accepted. The experience of exploitation of the water-
moderated water-cooled power reactor has shown that the supervision zone can be reduced to 15-16 km round the Nuclear Power Plant, as takes place at present in Russia. The particular size of a zone of supervision will be defined at a stage of the architectural project of the Belarusian Nuclear Power Plant.

According to the Technical Report of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus and the Ministry of Environment of the Lithuanian Republic on cooperation in the field of monitoring and information interchange about a condition of transboundary surface water dated April 10, 2008 at present transboundary monitoring on hydrochemical indicators on the transboundary rivers of Viliya River (National Park Bystrytsa) in the territory of Belarus and Nyaris River (National Park Buyvidjay) - in the Lithuanian territory takes place. Also interlaboratory comparison of the results of the measurement of the content of chemical contaminants are being carried out. The Belarusian Party has prepared the proposals on carrying out of radiation monitoring on the same range lines and interlaboratory comparison within the framework of execution of the above-mentioned Technical Report.

Question 33. The Report on EIA does not contain the information on emergency system and programs of actions of the Departments of Rescue Service in case of accidents. The measures which will be carried out at the Nuclear Power Plant should also be presented in the Report. The measures of protection of the population in case of accidents should also be described.

Question 34. It is very important to take into consideration that the measures on external notification and communication in case of emergency and emergency responses are the subject of the International Agreements of the Government Departments responsible for nuclear safety and radiation protection, protection of the population in emergency situations. The Report on EIA has not specified that the Republic of Belarus has signed the International Agreement in case of emergency situation at the Nuclear Power Plant and indemnification in this case.

Question 35. The information on concrete instructions of the International Atomic Energy Agency on nuclear and radiation protection in the course of preparation of the Report on EIA should be presented.

RESPONSE: By Decree No 565 of the President of the Republic of Belarus dated November 12, 2007 "On Certain Measures on Nuclear Power Plant Construction" (the National Register of Legal Acts of the Republic of Belarus, № 274, dated 19.11.2007, 1/9085) in the Ministry of Emergency Situations of the Republic of Belarus the body which regulates the issues of nuclear and radiation safety "Department on Nuclear and Radiation Safety" has been founded in which competence is the given issue.

The procedure and the system of urgent notification of the neighbouring countries in case of an accident has been developed by the competent organizations as part of the project of the Belarusian Nuclear Power Plant and is not the subject of EIA. We will mark out that the given procedure should provide for implementation of the obligations undertaken by the Republic of Belarus within the framework of the Treaty - Government of the Republic of Belarus, Government of the Republic of Poland dated October 26, 1994. Treaty between the Government of the Republic of Belarus and the Government of the Republic of Poland on Urgent Notification about Nuclear Accidents and Cooperation in the Field of Radiation Safety and the Agreement between the Government of the Republic of Belarus and the Cabinet of the Ukraine on Urgent Notification about Nuclear
Accidents and Cooperation in the Field of Radiation Safety” has come into force on October 16, 2001.

In EIA the information of the documents of the International Atomic Energy Agency which were used by the authors in the course of working out of EIA has been presented.

**Question 36.** In the Report on EIA there are no basic geological data: geological maps, geologo-tectonic cross-sections of the new region of the Nuclear Power Plant, the tectonic scheme of the territories being analyzed etc. The estimation of drawbacks and neotectonic vertical changes of ground surface also should be presented in the Report on EIA. Hence, the conclusions concerning geological conditions cannot be shown.

**RESPONSE:** The detailed information on competitive sites (Krasnopolyansky, Kukshinovsky and Ostrovetsky) is presented in the summary volume on the complex of research and prospecting works on choice of the site for placing of the Nuclear Power Plant in the Republic of Belarus (1588-PZ-OIZ the General Explanatory Note. Part I).

The choice of the site for placing of the nuclear object is the multifactorial problem connected with taking into account of the influence of environment on the nuclear object and the nuclear object on environment. Safety of the Nuclear Power Plant, radiation safety of the population and environmental protection around the Nuclear Power Plant at normal operation and with regard to design-basis accidents and out-of-design accidents along with technology and organizational measures are being provided for by the choice of a favourable location for placing of the Nuclear Power Plant and its appropriate distance from settlements, industrial enterprises, objects of culture and public health services etc. Thus, in the course of decision-making on suitability of the site for placing of the Nuclear Power Plant the following factors have been taken into consideration:

- Connected with influence of the Nuclear Power Plant on environment and radiation safety of the population;
- Caused by the events and the influences connected with activity of the human being;
- Connected with influence of an environment on safety of the Nuclear Power Plant.

**Criteria of Comparison**

The choice of a priority site took place on the basis of the analysis of competitive sites by the chosen criteria of comparison, by the following directions:

- Conformity with the requirements of the standard documents of the Republic of Belarus and the recommendations of the International Atomic Energy Agency;
- Natural and technogenic factors;
- Social and demographic factors;
- Ecological factors, including radiation pollution;
- Technical and economic factors.

The basic factor for a choice of the site was the criterion of safety.

**Question 37.** Explain, whether there will be any thermal load on Neris River (Viliya). If yes, in the Report on EIA the dispersion of thermal load and the results should be reflected. The given question is very important since heat pollution can
have considerable influence on flora, fauna, especially for hematocryal kinds of benthon and other water organisms of the Neris River (Viliya). Moreover, in the course of preparation of the program of monitoring the given prominent aspect should be taken into consideration. Describe what research should be included in the monitoring program.

**RESPONSE:** In the course of working out of EIA at a stage of substantiation of investments there was accepted that the whole volume of the water being deflected from Viliya River for industrial water supply of the Belarusian Nuclear Power Plant per 1,27 m³/s for one power block (2.54 m³/s for 2 power blocks) will be used in full volume without return to the river. The volume of the purified domestic sewage with consumption of 0,021 m³/s for 2 power blocks being deflected to Viliya River will not lead to essential deterioration of water in the river and to heat pollution because of insignificance of consumption of the stated waters (as compared with consumption of Viliya River), necessary degree of its purification, as well as the fact that their temperature mode during inflow to Viliya River will not be essential different from the background temperature mode under actual climatic conditions. The stated information on the volume and the structure of the purified domestic sewage of the Belarusian Nuclear Power Plant, as well on their influence on the quality of Viliya River as of November of 2009, has not been updated.

After clarification of the preproject decisions on the basis of water balance calculations of the Nuclear Power Plant according to St.-Petersburg Atomenergoproject Public Corporation there has been revealed that intake from Viliya River for 1 power block depending on the season amounts to 0,95 m³/s in winter up to 1,39 m³/s in summer (1,8-2,78 m³/s for 2 power blocks). At that evacuation of the wasted sewage which will be carried out on separate water conduit and be wasted to Viliya River at a distance of 500-1000 m below water intake «Muzhily», will amount for 1 power block from 0,48 m³/s in winter to 0,69 m³/s in summer (0,96-1,38 m³/s for 2 power blocks). It leads to reduction of the volumes of irrevocable water intake from Viliya River (from the initial as per EIA at the stage of JOI) by 2,54 m³/s for 2 power blocks, accordingly, up to 0,84-1,4 m³/s (by 1,8 times). It reduces the value of the maximum fall of levels on the site of Viliya River below placing of water intakes:

- at two power blocks and average annual consumption of water from 7 to 3 cm (from 5 to 1 cm in a transboundary range line - TRL), at minimum daily average consumption of 97 % of provision (probability of excess - PE) - from 11 to 6 cm (from 6 to 4 cm in TRL);

In view of evacuation of technical sewage of the Belarusian Nuclear Power Plant to Viliya River which as per the data of St.-Petersburg Atomenergoproject Public Corporation will have a temperature in place of discharge from the water conduit to Viliya River of 37°C, as well as contain various contaminants the question on estimation of possible heat and chemical pollution of the river becomes very important.

According to Appendix 1 to Decision № 43/42 of the Ministry of Natural Resources and Environment Protection of the Republic of Belarus and the Ministry of Public Health of the Republic of Belarus dated May 8, 2007 On Certain Issues on Rate Setting of Quality of Water of Fish Industry Water Objects the water temperature should not increase in comparison with the natural temperature of the water object for more than 5°C with general increase of the temperature of maximum 20°C in summer and 5°C in winter for water objects where salmon and pollan kinds of fish are found, but maximum up to 28°C in summer and 8°C in winter in other cases.
According to the specified nature protection requirements calculations of possible heat pollution of Viliya River below discharge of technical sewage has been carried out taking into account the criterion of non-exceeding of water temperature in the river: in summer maximum by 28 °C; for salmon kinds of fish – maximum 20 °C; in winter – maximum 8 °C for 2 for various hydrological conditions (at average annual and minimum daily 97 % of the internal radioactive poisoning at water consumption). The calculations have been executed at the maximum discharge of technical sewage with use of Frolov-Rodziller method and the recommendations of the Federal Hydrometeorology and Environmental Monitoring Service. At that the results of generalization of the given supervision over a temperature mode of Viliya River have been used. For calculations for summer conditions the monthly average maximum observed temperature of water 1% of internal radioactive poisoning - 23,8 °C was accepted; for calculations for the salmon kinds of fish the average temperature of water for the period of spawning (April-May) which amounts to 13,5 °C was accepted; For calculations for winter conditions - the minimum temperature of water - 2,0 °C was accepted. In calculations actual morphometric and hydrological characteristics of the river, including tortuosity of the river, and also a cross-section and longitudinal dispersion have been taken into account. As a result of calculations the distance to a control range line of practically entire hashing of river water and sewage, as well as distribution of temperature of water within a zone of hashing of river water and sewage at the specified site of water and estimation of the zones of heat pollution have been determined. In the generalized form the results of calculations are stated in the Table. The results of calculations are presented in the drawings in detail.
Table P.21 – General Conclusion on the Results of Calculation of the Possible Heat Pollution of Viliya River after Discharge of Technical Sewerage Of the Belarusian NPP at Installation of 2 Power Units

<table>
<thead>
<tr>
<th>Hydrological conditions of Viliya River lower water intakes of the BelNPP</th>
<th>Water consumption, m³/s</th>
<th>Width of the river, m</th>
<th>Mean depth of the river, m</th>
<th>Maximum depth of the river, m</th>
<th>Average flow velocity, m/s</th>
<th>Distance to the reference range line (RL), km</th>
<th>Temperature of water in the reference line and the depth of the section of heat pollution of the river at observance of the criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>At average annual water consumption</td>
<td>65,78</td>
<td>65,17</td>
<td>1,75</td>
<td>2,57</td>
<td>0,58</td>
<td>29,5</td>
<td>&lt;28 °C In summer: 24,07 0,45 14,0 0,60 2,8 1,10</td>
</tr>
<tr>
<td>At minimum average daily water consumption of 97% of PE within summer-autumn low water</td>
<td>21,25</td>
<td>57,38</td>
<td>0,91</td>
<td>1,55</td>
<td>0,41</td>
<td>33,2</td>
<td>&lt;20 °C For salmon: 24,07 5,00 14,0 7,00 - -</td>
</tr>
<tr>
<td>At minimum average daily water consumption of 97% of PE within winter low water</td>
<td>16,55</td>
<td>56,81</td>
<td>0,79</td>
<td>1,43</td>
<td>0,36</td>
<td>31,0</td>
<td>&lt;8 °C In winter: - - - - 4,3 13,0</td>
</tr>
</tbody>
</table>
При сбросе в зимних условиях

Температурный режим р. Вилия в зоне смешения речных и технических сточных вод белорусской АЭС при среднемноголетних расходах воды в реке и температуре технических сточных вод в 37°C при размещении 2 ЭБ

Fig. P.13
Temperatura воды в зоне смешения, град. С
Water temperature within the area of mixing, оС

Температурный режим р. Вилия в зоне смешения речных и технических сточных вод Белорусской АЭС при среднемноголетних расходах воды в реке и температуре технических сточных вод 37°C при размещении 2-х ЭБ
Temperature conditions of Viliya River in the area of mixing of river sewerage and technical sewerage of the Belarusian NPP at average annual water consumption and the temperature of the technical sewerage of 37оС at installation of 2 power units.

Расстояние от выпуска сточных вод вниз по реке, м
Distance from sewerage discharge downstream, m

При сбросе в летних условиях
At discharge in summer

При сбросе в период нереста лососевых
At discharge within the salmon spawning

Максимально допускаемая температура воды для летнего периода
Maximum permissible water temperature for summer period

Максимальная температура для водных объектов, где обитают лососевые и сиговые виды рыб
Maximum temperature for water basins where salmon and whitefish are found

Максимально допускаемая температура воды для зимних условий
Maximum permissible water temperature for winter period
Temperature conditions of Viliya River in the area of mixing of river sewerage and technical sewerage of the Belarusian NPP at minimum water consumption (low water level) and the temperature of the technical sewerage of 37°C at installation of 2 power units.

Distance from sewerage discharge downstream, m

Water temperature within the area of mixing, ºC

The estimation of heat pollution of Viliya River after discharge of technical sewage of the Belarusian Nuclear Power Plant with a temperature of 37°C has shown a heat pollution of Viliya River. Therefore for execution of nature protection requirements before discharge of technical sewage to Viliya River the engineering constructions on their
cooling are recommended: during the summer period – up to 25°C, in winter – up to 10°C.

Question 38. Describe in detail what technology will be used for technical water supply from the Neris River (Viliya) to the Nuclear Power Plant. The Report on EIA should include the calculations of water balance of the river and the characteristics of the drains. Consumption of water for cooling of the Nuclear Power Plant and loss of water as a result of evaporation should be calculated. The Report on EIA should include the careful hydrological analysis of the Neris River (Viliya) in two alternative places for surface water intake. The Report should include, at least, average multiannual discharges (average value (Q), Q 80 %, Q 95 % m³/s), and 30-day minimum discharges in summer-autumn and winter time (average value (Q), Q 80 %, Q 95 % m³/s) and ecological discharge. The Report on EIA should present a brief information on the measures which will be taken for ensuring of invariability of thermal and hydrological mode of Neris River so that pollution will not be increased and the quality of water of Neris River (Viliya) will not be worsened.

RESPONSE. Taking into account the executed hydrological research for placing of surface water intakes of the industrial water supply of the Belarusian Nuclear Power Plant the site National Park Malye Sviryanki-National Park Muzhily (length of a site - 2,4 km) have been chosen. Taking into account the information of Belkommunproject Production Republican Unitary Enterprise the length of the prospective lines of water conduits from the range lines of placing of water intakes on the given site to the Nuclear Power Plant site amounts to: 9,1 km from a water intake at the National Park Muzhily; 9,9 km from a water intake at the National Park Malye Sviryanki. The water from Viliya River is being taken and transported by pressure conduits to the Nuclear Power Plant site. Water intake constructions on Viliya River are situated on the left bank. The organization of surface water intakes of bucket type is supposed. The more detailed technology for supply of technical water from Viliya River to the Nuclear Power Plant will be developed and presented at a stage of architectural project.

In EIA the drainage characteristics and the corresponding water levels in Viliya River for the range line of water intake near the National Park Muzhily have been presented in detail. The range line of a water intake at the National Park Malye Sviryanki is situated by 2, 4 km above. At the given site there are no concentrated inflows, water intakes and water discharges. Therefore taking into account the change of the area of a basin water consumption in the river in the range line of the National Park Malye Sviryanki differ from water consumption at the National Park of Muzhily maximum by 0,5 % which is within the limits of errors of definition of hydrological values. Taking into account discharge of technical sewage of the Nuclear Power Plant in Viliya River the necessity of their cooling has been shown as recommendations. (See Response in respect of Question 37).

Question 39. Exploitation of the planned Nuclear Power Plant can change the hydrological characteristics, thermal conditions and the quality of Neris River (Viliya). Taking into consideration that the Lithuanian part of Neris River (Viliya) is the zone named Nature 2000 created for protection of a salmon, an otter, a lamprey, bitterling and other kinds of fish, and that Lithuania carries out special plans of measures on restoration and protection of the resources of a salmon and kinds of a brook trout, Belarus should guarantee that construction of the Nuclear Power Plant will not worsen the condition of water of Neris River.
RESPONSE: Basically concentration of polluting substances in composition of technical sewage as per the data of St.-Petersburg Atomenergoproject Public Corporation are within the limits or slightly exceed maximum permissible concentration of fish industry designation - except for zinc, phosphates, ammonia nitrogen, petroleum products excess on which excess can amount to 4 maximum permissible concentration. At mixture of technical sewage with river water on the specified indicators on the basis of preliminary calculations maximum permissible concentration are being achieved only at considerable distance downstream from a discharge place which also causes recommendations on additional purification of technical sewage up to the maximum permissible concentration of the fishing industry designation on conditions of minimization of their negative influence on the quality of Viliya River.

Estimation of decrease of water levels in the course of placing of the Belarusian Nuclear Power Plant with regard to maintenance of favourable regimes of pass of fishes for spawning to inflows of Viliya River.

According to the recommendations of the Scientific and Production Centre of the Belarusian National Academy of Sciences on Bioresources SSPA «... the critical (lowest) water level in Viliya River during the spring period for favourable conditions of spawning of migratory fishes should amount to at least 150 cm over mark"0" of hydrological post of Mikhalishki» which corresponds to 119,72 m of separator bawl and water consumption in the river of 68,8 m$^3$/s. According to hydrological supervision data the range of change of monthly average consumption of water in the river for more than 60 years for the spawning period amounts to: April - from 44,9 m$^3$/s to 498,0 m$^3$/s at average annual water consumption for April of 50 % of provision of 131,0 m$^3$/s; May - from 39,5 m$^3$/s to 163,0 m$^3$/s at average annual water consumption for May of 50 % of provision of 68,5 m$^3$/s. At that the ranges of natural fluctuations of the levels for the whole period of supervision amounts to: April - 3,09 m with decrease during low-water seasons up to 0,43 m of a water level favourable for spawning; May - 1,79 m with decrease during low-water seasons up to 0,66 m of a water level favourable for spawning. Taking into account the above-mentioned, decrease of water level at the cost of placing of the Belarusian Nuclear Power Plant under natural low-water conditions for the period "April-May" by 3-6 cm will add its negative, but far not decisive (8 % to existing decrease) contribution to the old problem of provision of a favourable water regime of Viliya River with maintaining of the recommended levels in spawning. Therefore it is reasonable to carry out complex solution of the specified environmental problem. The basic way of solution of the stated problem could be increase of efficiency of management on outflows from the Vileysky water basin, including gradual accumulation of necessary additional volumes of water in it in flood time (including with regard to compensation of decrease of the levels in case of Nuclear Power Plant placing) and the subsequent outflows during low-water seasons for maintaining of the recommended levels for favourable conditions for spawning. At that the additional volumes of water accumulated during surplus water periods in the Vileysky water basin up to 70 million m$^3$ within the range from normal pool level=159 m of separator bawl to highest water level=159,8 m of separator bawl will be enough for covering of the deficit periods during the possible low-water periods.

It is necessary to notice that the favourable conditions for calling at the inflows of Viliya of migratory kinds of fish except for the level regime of Viliya River also depend on a hydromorphological condition of mouth reach of inflows. It is connected with the fact that the natural character of free meandering of Viliya River and high current speeds (especially at bed-formation expenses, as well as during flood time and high water periods) lead to intensive channel deformations of the river, including washouts,
sedimentation, reformation of banks which in its turn can lead to change of mouth reaches of inflows (siltation or washouts) which can hamper pass of fish. Therefore maintaining of mouth reaches and inflows of Viliya River in good hydromorphological condition close to natural, including their timely clearing will also promote more favourable conditions for spawning.

Let us notice that out of the received letters the following issues are out of competence of BelNIPIERGROPROM Republican Unitary Enterprise:

**The Ministry of Environment of the Republic Lithuania.**

1) The procedure on EIA according to the Belarusian legislation is unconvincing. For understanding of a difference between different stages of the given procedure it is necessary to give the general idea of the Procedure on EIA informing and participation of the concerned countries and various stages of the given procedure. (In our opinion - Ministry for Protection of Environment and Natural Resources).

2) Construction, exploitation and decommissioning of the Nuclear Power Plant should be carried out according to the highest standards of safety. Implementation of the requirements of the given standards should be ensured during the whole service life of the plant. The legal basis for stages of licensing within the period of execution of construction of the Nuclear Power Plant is not presented in the Report on EIA. The information on the licensing procedure as part of the final stages of the given process, national requirements to it should be included in the Report, and role of EIA should be explained. (In our opinion - Gosatomnadzor).

3) It is not clear how the Republic of Belarus will develop a national infrastructure before, in the course and after construction of the Nuclear Power Plant so that to provide for due implementation of the following principles of the nuclear safety presented in publications SF-1 of the International Atomic Energy Agency. During carrying out of EIA it is necessary to pay special attention on execution of the following three principles: (In our opinion - Gosatomnadzor, Department on Nuclear Power):

1) The basic responsibility for safety should be assigned to the person or the organization responsible for the equipment and activity, which could cause the risks connected with radiation. Namely, how the organization responsible for nuclear safety will be established, and how its ability to organize the project, construction and execution of other actions important for nuclear safety will be authentically estimated?

2) The effective legal and state structure on safety, including independent regulatory authority, should be founded and supported. Namely, whether the Republic of Belarus will develop an infrastructure necessary for ensuring of the competent staff of technical support and carrying out of independent estimations of nuclear safety according to the recommendations of the International Atomic Energy agency?

3) The effective management and control of safety should be established and supported in the organizations dealing with radiation risks, the equipment and activity which can cause such risks. Namely, what standards for the systems on protection of environment and management will be applied by the organizations which are carrying out the measures important for safety of the new Nuclear Power Plant?

13) It is not clear whether there is a national concept or strategy about management of a nuclear waste. (In our opinion - Department on Nuclear Power).
2.5.2  Replies to remarks (comments) of the Lithuanian party, stated in the letter of the ministry of environment of Lithuania № (10-3)-d8-4486 dated 7 May, 2010

Table P.22

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<td>1.</td>
<td>The question is not fully answered. The Preliminary Report was send to Lithuania, but such kind of Reports is not presented in the explanation of the EIA procedure. The difference between Application of possible environmental impact and Report on environment impact assessment is not clear. Also it is not clear if the comments, remarks and suggestions of other countries will be taken into account. It will be very useful to know when the decision on site selection according to Belarusian legislation should be made. If site has not been selected yet, the radiological impact from all three alternative sites should be evaluated that was not been done in this Report (also see Question No, 5).</td>
<td>The procedure of carrying out of environment impact assessment in the course of development of preproject and project documentation has been described in Chapter 4 of “The Instruction of the Order of execution of Environment Impact Assessment of the Planned Economic and Other Activity in the Republic of Belarus. Has been approved by Resolution № 30 of the Ministry of Nature of the Republic of Belarus dated June 17, 2005”. The comments, remarks and proposals of other countries will be taken into consideration in the course of upgrading of EIA. As it has been stated in EIA, the Ostrovets site has been chosen as the priority (basic) site, Section 4.1. The Decision on the choice of the site will be taken in conformity with Law of the Republic of Belarus № 426-3 dated July 30, 2008 “On Use of Atomic Power”.</td>
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<td>2.</td>
<td>The question is not fully answered. The information about the licensing authority, requirements on licensing and other regulations is presented, but the licensing procedure, during which the main step - safety assessment of NPP - must be performed, is not explained. To understand overall view of authorization procedure of the new NPP the time schedule of different steps of authorization should be presented.</td>
<td>The requirements on licensing have been stated in Law of the Republic of Belarus № 122-3 dated January 5, 1998 “On Radiation Safety of Population”.</td>
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<td>3.</td>
<td>From the response of the Republic of Belarus to the Question No. 3, it became clear that Ministry of Emergency carries out state control in the field of nuclear and radiation safety, and that Belarus is still developing the legal and regulatory framework for licensing of a new nuclear power plant. The answers provided by Belarus to the Question No. 3 seem acceptable at this early stage of the new nuclear power development program in Belarus with that understanding that Belarus will: • continue work on development of the efficient, clear and transparent regulatory framework; • develop independent regulatory authority, that will implement itself and also will require from licensees and organizations providing technical support for development of the national nuclear power program such</td>
<td>We agree with the assessment of our reply. Your remarks will be taken into consideration at the relevant stages of work.</td>
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<td>management systems, that are compliant with the international standards for management systems, e.g. GS-R-3 IAEA;</td>
<td>In Section 4.1. of EIA* “Alternative Sites of Nuclear Power Plant Construction”, it is stated that:</td>
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<td>• improve and continue practices of communicating with interested parties within the state and with international community on nuclear and environmental safety related issues.</td>
<td>- for all three competitive sites there are no prohibiting factors (that is the factors, conditions which do not permit location of the NPP site as per the requirements of the standard documents.</td>
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<td>4.</td>
<td>The answer contradicts to information presented in The Preliminary Report. According to the Preliminary Report the possibility of suffusion and karst processes activation is the only complicating factor for selection of Kukshinovo and Krasnaya Polyana sites. But in the answer to our request to complement and justify the priority of Ostrovets site it is stated that according to the valid legislation of the Republic of Belarus it is prohibited to locate NPP on the territories where active karst has been detected or where there is a possibility to activate diffusion-karst processes. If it is true the site alternatives in the environmental impact assessment were not evaluated and the Ostrovets site is not the priority site but only one site proper for NPP placing. Also it is not clear if research and prospecting works on choice of the site for placing of NPP were performed in accordance with IAEA Safety Requirements &quot;Site Evaluation for Nuclear Installations&quot;, NS-R-3, and other guides on site evaluation for nuclear power plants.</td>
<td>- At Krasnaya Polyana and Kukshinovo sites there is a possibility of activization of suffusion-karst processes which is the complicating factor. Engineering-geological and hydrogeological conditions of the Kukshinovo site are complicated (there is no regularity in occurrence of soils of different structure and properties, there is pressure water the piezometric levels of which is being located close to the ground surface up to 1,5 m).</td>
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<td>- By the complex of factors which have great importance Ostrovets site has an advantage before Krasnaya Polyana and Kukshinovo sites.</td>
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<td>5.</td>
<td>The response concerns criteria of the NPP site selection but no comparison of three sites on the degree of fatal influences on environment. The information about the possible impact of NPP on the environment in the 30-km zone around each of three potential sites: Krasnaya Polyana, Kukshinovsk and Ostrovets sites should be presented. The impact of sites on environment components should be compared.</td>
<td>As per TKP 098-2007 “Location of Nuclear Power Plants, basic Requirements to Composition and Volume of Survey and Investigation in the Course of Choice of the Nuclear Power Plant Site”, pp. 10, 11, at the stage of the choice of the site the work on assessment of potential effect of the Nuclear Power Plant on environment has been executed at all three sites. The data have been represented in Section 4.1. “Alternative Sites for NPP Construction”, Tables 3-5.</td>
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<td>6.</td>
<td>The response is given only for the part of the question related with the collective dose. Regarding to the risk acceptance, risks from all three potential sites were not analyzed and their acceptances for Lithuania were not evaluated. According to nuclear safety principle (presented within IAEA publication SF-1) facilities and activities that give rise to radiation risks must yield an overall benefit. It is not clear how in the implementation of this principles risk and benefit for Lithuania will be taken into consideration.</td>
<td>In EIA there has been stated that the dose limits established for the power block of NPP-2006 and the target probability rates completely meet the requirements of the valid Russian Normative Documents (ND), the recommendations and the safety standards of IAEA, the International Advisory Group on Nuclear Safety (INSAG1 - INSAG12) and the requirements of the European exploiting organizations to the projects of the nuclear power plants of the new generation with the reactors of PWR type.</td>
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7. The response is accepted.

8. We agree that comparison of various types of reactors is not the
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<td>matter of EIA. But the description (fuel, coolant, operating pressure, core outlet temperature, specific volume power, efficiency, containment) of various types of reactors (PWR, BWR, CANDU) is presented in the Report and conclusions about positive characteristics of PWR reactors are based on this description. Some of conclusions (statement that doses from PWR reactors are minimal) should be justified, otherwise such statements are only declaration without any substantiation and give doubt about the reliability of the given information.</td>
<td>NPP”, in Table 43 the values of the collective and average individual doses of radiation of the personnel of the NPP and the personnel of the organizations being employed for the works on the NPP in year 2005 are stated (Annual Report on Activity of the Federal Service on Ecological, Technological and Nuclear Supervision in 2005”.</td>
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<td>9.</td>
<td>In the Report the fact that the main equipment and security systems of this project are already tested on operating NPPs (2 power supply units in China) and possibility to return spent nuclear fuel for long-term storage and refinement on the territory of Russian Federation are indicated as the advantages of NPP-2009 project compare with other projects. It is also unclear if other features and criteria and which of them were analyzed in analysis of industrial reactors units. Also it is not clear the difference between data given in the Table 6 (heavy damage of core &lt;5.8 x 10^{-7}, per reactor annually, and emergency limit radiation release from a reactor unit &lt; 1.0 x 10^{-8} per reactor annually) and the Table 9 (calculated probability of heavy damage of core for all initiating events &lt; 10^{-5}, per reactor annually, and calculated probability of limit radiation release in case of an accident beyond the design basis &lt; 10^{-7} per reactor annually). The meaning of these data should be explained.</td>
<td>Probability of heavy damage of core is &lt; 5,8 x 10^{-7} 1/year.reactor; Probability of frequency of the maximum accident discharge of radiation from the plant is &lt; 1,0 x 10^{-8} 1/year.reactor; The calculated values of the probability of heavy damage of core for all initiating events is &lt; 10^{-5} The calculated probability of achievement of the maximum accident discharge at out-of-design-basis accident is &lt; 10^{-7} 1/year.reactor. The target probability rates established by the exploiting organization for the power block of the NPP-2006 (NPP-2006. Performance Specification on Development of the Basic Project. Year 2006): Decrease of probability of the accidents on the power block with serious damage of core of the reactor up to the level of 10^{-6} 1/year.reactor and more serious discharges outside the territory of the site for which urgent countermeasures outside the site are necessary, by the level of 10^{-7} 1/year.reactor.</td>
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<td>10.</td>
<td>The values specified in the response are characteristics of light airplane. It means that the Belarusian NPP of 2006 Project will be not protected against a wreck of heavy aircraft or military jet (military jets have the speed no less 1000 km/h i.e. about 3 times more than 100 m/s = 360 km/h). This fact is important taking into account the possibility of air terrorism.</td>
<td>Double containment shell of the Project of NPP-2006 provides for reliable protection of the NPP in case of aircraft falls and falls of great aircraft fragments, for example, engine.</td>
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<td>11.</td>
<td>The response is accepted.</td>
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<td>12.</td>
<td>The Report states that the spent nuclear fuel is to be removed to processing plants or to the supplier-country of the nuclear fuel. What legal measures will warrant that it will be implemented and spent nuclear fuel will not be stored and disposed in Belarus? If spent nuclear fuel will be returned to Russia, measures for safety of spent nuclear fuel transportation should be discussed, because this action is determined by operation of NPP and impact of this activity should be also evaluated.</td>
<td>Conclusion of the agreements between the Republic of Belarus and the Russian Federation on construction of the Nuclear Power Plant in the Republic of Belarus in conformity of which the spent nuclear fuel (SNF) will be transported to the Russian Federation. The SNF will be temporarily stored in the cooling pond situated inside of the containment. The technological radioactive waste of the NPP will be stored in the territory of the Republic of Belarus. The volume of this waste is up to 50 m³/year per one power block. The technology of transportation of the SNF is well-tested. There is no case of impact of this procedure on environment registered in the world for all time.</td>
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<td>13.</td>
<td>Only fact that radioactive waste management concept exists and now is being reviewed is mentioned but details on plans for radioactive waste storage and disposal in Belarus are not presented. The plans for management of decommissioning waste as well as operational waste in this concept should be considered. Also it should be taken into account that the financial resources for decommissioning and management of decommissioning waste should be envisaged before the operation of NPP starts.</td>
<td>The Project of NPP-2006 provides for storage of technological radioactive waste at the Nuclear Power Plant for 50-60 years. Construction of the local waste burial place is not connected with the Project of the NPP. Accumulation of the resources for decommissioning of the NPP is provided for.</td>
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<td>14.</td>
<td>The response is accepted.</td>
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<td>15.</td>
<td>The Question No. 15 was based on English version of the EIA Report, During the ... (???) ... ... .....</td>
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<td>16.</td>
<td>The report does not provide a detailed description of the impact of the used water returned to Neris on the river's chemical regime. As there are water intake sites (water extracting sites) located on the banks of the river Neris, and their resources are partly formed by the river water, the possible chemical changes of the river water will affect the quality of drinking water.</td>
<td>The given question has been considered in Section 7.3.3. “Liquid Waste Discharge to Environment”</td>
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<td>17.</td>
<td>The questions are not fully answered. According to the answer, sanitary standards SP AS-03 of the Russian Federation stipulate that population exposure to radiation as a result of discharges from a nuclear power plant under design or construction must not exceed 100 m3v/year, divided between airborne and liquid discharges (50 m3v/year each). However, according to page 177 of the environmental impact assessment (ELA) report on the Baltic Nuclear Power Plant (Kaliningrad Region), SP AS-03 indicate 10 m3v/year per each route of exposure. The 100 m3v/year dose limit in the event of disturbances in normal operation is mentioned in pages 178-179. Therefore, it is not clear what requirements are actually established in regulatory acts and which of the values are correct.</td>
<td>As per p. 5.10 of SP AS-03: “As the lower level of the dose of radiation from separate radiation factor at optimization of radiation protection of the population in the mode of normal exploitation of the NPP the minimum significant dose equal to 10 m3v/year has been accepted”. Point 5.11. SP AS-03: “With regard to the achieved level of safety of the NPP in the mode of normal exploitation (when the actual discharges of the NPP generate on each factor of impact the population radiation dose of less than 10 m3v/year) the radiation risk for the population at exploitation of the NPP is unconditionally acceptable (&lt;10^−6 year^−1). In this respect the values of acceptable discharge levels (further – AD) being established by the present Rules are being calculated with regard to the dose of radiation of the population equal to 10 m3v/year”.</td>
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<td>18.</td>
<td>Since there is no possibility to study the indicated regulatory acts, it is not possible to get information on the effective requirements. According to the answer, the levels set out in the regulatory act of the Russian Federation conform to international standards. However, no substantiation for this assertion has been presented and the international standards that the levels conform to have not been indicated.</td>
<td>The reply is given in point 17.</td>
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<td>19.</td>
<td>The presented answer to question 19 does not answer the question as it indicates the composition of low-activity waste and The Project of NPP-2006 does not provide for liquid radioactive waste discharge to the environment.</td>
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<td>four radionuclides (Fe-59, Co-60, Cr-51 and Mn-54) in the first circuit. However, Table 24 of the EIA report provides data on radionuclide release into water bodies. The presented information on the nuclide composition of discharges into water should include data on predicted quantities of radionuclide (such as Cs-137, Cs-137, Sr-90, H-3, etc.) discharges into water typical of a nuclear power plant as well as information on limit discharges established in regulatory documents.</td>
<td>The works carried out at the stage of the choice of the site are represented in the previous reports. As per the calculations the maximum total value of the collective doses within 30-km zone at normal exploitation amounts to $2.87 \times 10^{-4}$ mSv. We think it is unreasonable to consider in the Report on EIA the effects which are not subject to quantitative assessment and in no way effect on the state of environment.</td>
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<td>We agree that the average annual dose for population determined by NPP operation may be negligible compare with the dose from the natural radiation. However for purpose to show the impact of radiation determined by NPP, the dose for population should be evaluated. If this dose is forecasted in &quot;The Report on Studying the Possibility of Placing of the Nuclear Power Plant in the republic of Belarus. A Complex of Works on Studying of Hydrology, Radiology, Ecology, Land Tenure Conditions at Nuclear Power Plant Placing on the Ostrovetsky and Verhnedvinsky Points&quot;, the summary of the evaluation and results of calculation should be presented in the Report. Unfortunately we have not access to the document mentioned in the answer and there is no possibility to find above mentioned results.</td>
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<td>21.</td>
<td>The necessity to model the processes of transfer of radioactive pollution in the course of normal operation mode of NPP is the decision of the authors of the EIA, but such modeling and its result can serve as a tool to demonstrate the value of radioactive impact not only for Belarus but also for neighboring countries. The dose for critical group associated with NPP taking into account characteristics of the proposed site (dispersion of radioactive material discharged into air, surface water and groundwater) and design of nuclear installation should be present in the Report. In accordance with IAEA Safety Guide &quot;Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants&quot;, NS-G-3.2, to evaluate the potential radiological impacts of normal radioactive discharges and accidental releases to neighboring countries the persons in the critical group may be located beyond national borders.</td>
<td>In Section 14.5 “Radiation Impact” the answer to this question is presented in the volume sufficient for EIA stage.</td>
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<td>22.</td>
<td>The question is not fully answered. There is no explained why maximum design-basis accidents (MDA) is not analyzed during the winter season.</td>
<td>The most dangerous is the summer scenario of discharge (the period of vegetation and use of greens). Out of the conditions of conservative assessment the summer scenario has been analyzed.</td>
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<td>23.</td>
<td>The question is not fully answered. Only information about analyzed accidents scenarios and computer code that was used for simulation of radionuclides dispersion and deposition is presented. It is not clear why two different source terms were evaluated (131I 1E+14 Bq, 137Cs 1E+13 Bq for the 1st scenario and 131I 3.1 E+15 Bq, 137Cs 3.5E+14 Bq for the 2nd scenario). The explanation why such source terms and summer season, such meteorological conditions (wind speed 1 m/s) and modeling conditions (boundaries of emission 21-25 m) for the evaluation were</td>
<td>For the assessment of impact on biota, soil pollution discharge 131I 3.1E+15 Bq, 137Cs 3.5E+14 Bq has been used which corresponds to INES 6 (NNPP_EIAR_D2_Combined_Ru_200808_FINAL). The release height of 21-25 m had been taken with regard that transport lock is situated at this height. The expected radiation doses for population have been calculated at the maximum design-basis accident and out-of-design-basis accident on the power block. The dis-</td>
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<td>chosen should be given.</td>
<td>charge of radionuclides being taken into consideration for calculation at out-of-design-basis accident has been presented in Table 157</td>
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<td>More background information on the beyond design-basis accident scenarios and the graphic information on the fields of density of pollution of $^{131}$I and $^{137}$Cs radionuclides is given in the answer. But the graphic information on contamination levels of radionuclides is given only for the 1st scenario. The Report should be supplemented with the graphic information on contamination levels of radionuclides for the 2nd scenario also.</td>
<td>In EIA 2 most conservative scenarios have been presented:&lt;br&gt;- the scenario of pollution of small area, Table 139, Figure 96,&lt;br&gt;The scenario of pollution of a great area, Table 140, Figure 97,</td>
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<td>25</td>
<td>The question is not fully answered. In the answer there is no information about the results of calculation of pollution in the Republic of Lithuania under condition of BDB A with South-West emission trace and the worse meteorological conditions. It is necessary to have clear answer to assess a risk for population and to prepare emergency preparedness plans.</td>
<td>The scenario of pollution of a great area, Table 140, Figure 97, has been presented for pollution of the territory of the Republic of Lithuania at the worst meteorological conditions.</td>
</tr>
</tbody>
</table>
| 26 | The question is not fully answered. If source term of Belarusian NPP in case of DBA is compared with maximum emergency emission of radionuclides from Novovoronezh NPP-2 and some conclusions based on this comparison are made, it should be explained what does the term “maximum emergency emission” mean and when, for what purposes and by whom it is determined? Is it the same as the maximum permissible values of accident emissions (for project NPP-2006 these values are 1E+14 Bq for $^{131}$I and 1E+13 Bq for $^{137}$Cs)? | In the Project of the NPP-2006 the DBA is established on the basis of the achieved level of safety for the class of serious accidents on the block:<br>- for earlier phase of the accident connected with leakages of FP (fission products) through leakinesses of double containment shell and bypass of the containment, at lack of power supply on the block: xenon-$^{133}$-10$^4$ TBq; iodine-$^{131}$ -50 TBq; cesium-$^{137}$ -5 TBq.<br>- For intermediate phase of the accident after restoration of power supply on the block connected with discharge through the ventilation pipe: xenon-$^{133}$-10$^5$ TBq; iodine-$^{131}$ -
<table>
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<tr>
<th>№</th>
<th>Remarks (Comments) of the Lithuanian Party</th>
<th>Replies of the Belarusian Party</th>
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<tbody>
<tr>
<td>27.</td>
<td>The response is accepted.</td>
<td>50 TBq; cesium-137 – 5 TBq.</td>
</tr>
<tr>
<td>28.</td>
<td>The response is accepted.</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Answering question 29, in which they were asked to assess the effects of tritium and other radionuclides on the River Neris in the territory of Lithuania, the EIA authors used data on the volumetric activity of radionuclides in Lake Druksiai and immediately rejected tritium due to its negligible effect. There is a table containing predicted maximum values for three radionuclides (Sr-90, Cs-137, 1-131), with the obtained values compared with Russian Standard 2000. We consider the rejection and failure to assess H-3 to be incorrect for a few reasons: different type reactors, different type water bodies. It is also not clear why other radionuclides, such as Co-60, Mn-54 and other, have not been assessed. The table presents the maximum volumetric activity value of hundreds of thousands of times higher than the same volumetric radionuclide activity concentrations determined in Druksiai Lake, where radionuclide volumetric activity is becquerel or ten Becquerel per cubic meter of row. Neither the EIA report nor the answers to the questions provide information on potential radionuclide accumulation in bottom sediments and sites where such accumulation may occur, which may also be in the territory of Lithuania.</td>
<td>As per the Norms of Radiation Safety NRS-2000 the level of interference for H-3 is equal to 7700 Bq/l, for cesium-137 = 5,0 Bq/l, thus their ratio is equal to 7700:5 = 1540. The ratio of cosmogenious and anthropogenic H-3 is equal to $10^4$. The long-term observations of Youzhny Bug River (years 1988-2009), South Ukrainian NPP, have shown that concentration of H-3 is being varied within the limits 15-30 Bq/kg which is significantly lower than the level of interference. The water-moderated water-cooled power reactors-1000 are installed at the South Ukrainian NPP (small series = 2 pcs.) and RP-320 (one block). The liquid radioactive waste is being generated as per the technology. There has not been established overshoot of concentration of Co-60, Mn-54 and other radionuclides in the Youzhny Bug River. The Project of NPP-2006 does not provide for the liquid radioactive waste discharge to the environment.</td>
</tr>
<tr>
<td>30.</td>
<td>The response is accepted.</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>The response is accepted, the corrected value should appear in the Report.</td>
<td>The given value (25 km) is being used in the Report.</td>
</tr>
<tr>
<td>32.</td>
<td>The response is accepted. In Chapter 5.4.1 of the EIA Report, it would be useful to refer the “Technical Report of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus and the Ministry of Environment of the</td>
<td></td>
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<tr>
<th>№</th>
<th>Remarks (Comments) of the Lithuanian Party</th>
<th>Replies of the Belarusian Party</th>
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<tbody>
<tr>
<td>33</td>
<td>Information about accident system and action programs of competent and rescue ... (???) ... .....*</td>
<td>The plans of accident system and action programs of competent bodies are being worked out.</td>
</tr>
<tr>
<td>34</td>
<td>Additional information is presented, but the complete answer is not given. If the procedure and the system of urgent notification of the neighbouring countries in case of an accident have been developed by the competent organizations as part of the project of the Belarusian Nuclear Power Plant, this procedure and system should be described. Also information about laws, conventions, civil liability, compensation for nuclear damage should be added. Agreements on Urgent Notification about Nuclear Accidents and Cooperation in the Field of Radiation Safety with Poland and Ukraine are mentioned. We would like to notice that it is very important that such agreement with Lithuania will be established also.</td>
<td>The issue on conclusion of the Agreement on Urgent Warning of the Nuclear Accidents and Cooperation in the Field of Radiation safety is not the subject of EIA. The draft of this Agreement is at the stage of consideration of the Parties.</td>
</tr>
<tr>
<td>35</td>
<td>Specific IAEA nuclear safety and radiation protection guides that were used as references during the preparation of EIA report are not provided. Chapters 1.3 Basic normative documents and Chapter 9. References don't include any IAEA nuclear and radiation protection guides.</td>
<td>Section 20 “List of Reference Normative Documents and Literature”,</td>
</tr>
<tr>
<td>36</td>
<td>The report lacks geological, seismological, and seismo-tectonic data. A reference is provided to the document &quot;Report on a Feasibility Study of the Construction of a Nuclear Power Plant in the Republic of Belarus (1588-PZ-PIZ. Principal Explanatory Note, Part I)“, but this document has not been made available for familiarisation and evaluation. The statements presented in Tables 1 and 3 of the report concerning the tectonic structure and</td>
<td>The given materials have been considered at the stage of the choice of the site, the resulting materials in the form of Tables 3-5, Section 4.1. “The Alternative Sites of the Nuclear Power Plant Construction”, have been included in the EIA .</td>
</tr>
<tr>
<td>№</td>
<td>Remarks (Comments ) of the Lithuanian Party</td>
<td>Replies of the Belarusian Party</td>
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<tr>
<td></td>
<td>stability of potential sites, the seismic and tectonic activity, the amplitudes of horizontal and vertical movements of Earth's surface and the magnitudes of the projected and maximum earthquakes, the distances of the sites from seismic hazard zones and the seismic qualities of soil are not based on factual data and/or documents.</td>
<td>The given questions (37-39) have been considered in detail in the Report on EIA, Section 14.4 “Nuclear Power Plant Impact on Environment”, and Section 18 “Proposals on Organization of the Program on Ecological Monitoring”,</td>
</tr>
<tr>
<td>37.</td>
<td>The questions are not fully answered. The impact of thermal pollution on the flora and fauna (in particular salmon), benthos and other hydrobionts of the river Neris must be assessed. There is no information on the envisaged measures mitigating an adverse effect on the sensitive ecosystem of the river caused by heat pollution, hydrological regime, and polluted waste. Based on the information supplied in respect of the quantities of water required for the cooling process, it is not possible to evaluate the reliability of the data and the validity of the conclusions claiming that no adverse impact will be exerted on the river Neris and the qualitative and quantitative indicators of the water will not deteriorate. We would also like to point out that River Neris monitoring must be planned. Particular attention should be given to the monitoring of the temperature of cooling water discharged into the river. Therefore, there must be a monitoring program to facilitate regular monitoring of temperature changes, quantitative and qualitative water parameters of the River Neris. The presented information on the quantities of water used for cooling does not suffice for us to evaluate data reliability and validity of the conclusions that there will be no negative effect on the River Neris and qualitative and quantitative water parameters will not be affected. The question is not fully answered. The EIA report does not describe in detail the manner in which water will be taken from Neris river. It needs to indicate whether dam-</td>
<td></td>
</tr>
<tr>
<td>№</td>
<td>Remarks (Comments) of the Lithuanian Party</td>
<td>Replies of the Belarusian Party</td>
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<td></td>
<td>construction measures will be employed, whether a water reservoir will be constructed. It should be noted that fish protection measures must be envisaged at the sites of collection and discharge of the water intended for cooling. There must be an automatic monitoring system in the River Neris to provide early warning of emergency cases and increased levels of prohibited discharges to our country. Information on ways to ensure that no radioactive substances are discharged from the cooling system into the natural environment, ground and surface water (particularly into the River Neris) must be provided. It is necessary to plan means and preventive measures to ensure that cooling water contaminated with radioactive substances does not pass into surface water bodies and no damage is done to the natural environment of Lithuania in the event of various accidents.</td>
<td></td>
</tr>
</tbody>
</table>

EIA* - the Report on EIA of the Belarusian NPP which was placed at www.dsaе.by 04.03.2010 is in chapter «NPP Ecology». 
### 2.5.3 The account of remarks received from Lithuanian Republic during EIA procedure of Belorussian APS

**Table P.23**

<table>
<thead>
<tr>
<th>EIA procedure according to the legislation of the Republic of Belarus is unconvincing. For understanding of a difference between different stages of the present procedure it is necessary to give the general idea about EIA procedure, informing and participation of the countries concerned and various stages of the present procedure.</th>
<th>It is not EIA subject (Addition II) The general idea of EIA procedure, informing and participation of the interested countries and various stages of this procedure are set out in the legislation of the Republic of Belarus, and also in the international contracts (the Convention of Espoo and the Orhussky Convention)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 2. Construction, operation and decommissioning of APS shall be carried out according to the highest safety standards. Requirements meeting of the present standards should be provided during all service life of installation. The legal platform for licensing stages during construction of the APS is not presented in EIA. The information on licensing procedure as parts of the final stages of the mentioned process, national requirements to it should be included in the report and role EIA should be explained.</td>
<td>It is not EIA subject (Addition II) It is not EIA subject (Addition II) Section 3.2 The main regulations, controlling the activity in the atomic energy field in the Republic of Belarus,</td>
</tr>
<tr>
<td>It is unclear, how the Republic of Belarus will develop a national infrastructure before, during and after APS construction to provide due fulfilment of the following principles of the nuclear safety stated in publications SF-1 IAEA.</td>
<td>It is not EIA subject (Addition II) Development of a national infrastructure is carried out within the limits of separate governmental programs, as well as programs of technical cooperation with IAEA</td>
</tr>
<tr>
<td>The population dose as distance and direction function should be counted and used as the mechanism on estimation of radiological risk. The useful way for demonstration of the corresponding influences on Belarus and the countries involved could be calculation of the population dose at normal operation in each state. Then it would be necessary to compare the given calculations with the corresponding advantages of the Belarusian APS in relation to each state.</td>
<td>Section 15.4 Lithuanian Republic</td>
</tr>
<tr>
<td>In EIA there are no data about air corridors close to the alternative sites of the APS, intensity of flights in these corridors and distance to the nearest civil and military aerodromes. It is very important to compare alternative sites according to these criteria.</td>
<td>It is not EIA subject (Addition II) That information is contained in the design documentation which component is EIA. Works for APS site selection preceded EIA development.</td>
</tr>
<tr>
<td>In Chapter 2.3.4 the positive characteristics of reactors PWR have been listed, but not all of them have</td>
<td>It is not EIA subject (Addition II) Section 6.4 The project de-</td>
</tr>
</tbody>
</table>
been proved. The information illustrating that the doses from reactors PWR are minimal should be added. It is necessary to submit some comments on all the characteristics.

Question 9. In Chapter 2.5 it has been underlined that the Russian Project for the Belarusian APS has been chosen after the comprehensive analysis of the power supply units and reactors. What characteristics and criteria were used and were important for the mentioned selection? The results of this analysis which have been made for selection should be submitted in the EIA Report.

<table>
<thead>
<tr>
<th>Drawing 6 shows that reactor tightness can sustain plane crash. But quantitative (weight, rate of fall) or qualitative (plane type) characteristics of such influence have not been presented. The EIA Report should be added by indicator characteristics.</th>
<th>Section 6.8.2 System of sealed enclosure (containment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Table 12 it is written that effective duration by installed capability within a year is at least 8400 hours. On page 61 of the EIA Report (the English version) it is written that calculation of the total amount of the formed slag on service of two blocks is based on nominal operating hours (6500 hours per year). Explain this difference or correct one of the mentioned values.</td>
<td>Section 6.4 The description of project – APS analogue and the basic design characteristic</td>
</tr>
<tr>
<td>The information on transportation and fuel storage is insufficient. The presented documentation only specifies that the spent nuclear fuel will be transported by lots in the special transport packings. The information on nuclear fuel transportation safety (technical and administrative measures should be specified) and environmental influence of this transportation should be presented in detail.</td>
<td>Section 8 The treatment of nuclear fuel</td>
</tr>
<tr>
<td>It is unclear, whether there is a national concept or strategy on nuclear waste management?</td>
<td>It is not EIA subject (Addition II)</td>
</tr>
<tr>
<td>The Report does not contain the volume and activity forecast on liquid radioactive waste. It is necessary to add in the Report a quantitative estimation of liquid radioactive waste.</td>
<td>Section 7.5 The treatment of radioactive waste</td>
</tr>
<tr>
<td>Table 15 illustrates «The Set Values of Global Emissions» and &quot;Actual Data&quot; about the general cumulative emissions in atmosphere. Please, explain the expression “The Set Values of Global Emissions”. Who has determined this value? In what document and on what terms the given value is submitted? Please, explain, to which concrete station with a reactor PWR-</td>
<td>Section 7.4.1 Radioactive gases and aerosols emissions from station</td>
</tr>
</tbody>
</table>
1000 does the Actual Data relate? How will they correspond to the data for the planned APS which has high capacity, and, probably, has another design, other equipment and technology?

<table>
<thead>
<tr>
<th>The effect of radionuclides emissions in atmosphere from various APS is presented in Section 3.1.5 as an illustration. If it is supposed that emissions from the Belorussian APS will be equal to that accepted in Russia, only percent of the levels of emissions of the authorized release (Table 23) is represented and the reference to the standard documents. Unfortunately, we do not have access to the documents specified in the Report, and at the same time to the ability to find out the standard rates. In fact, the emission standards operating in Belarus are not presented. The information on how the authorized release level in Belarus will be defined should also be presented.</th>
</tr>
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<tr>
<td>Section 7.4.1 Radioactive gases and aerosols emissions from station</td>
</tr>
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</table>

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<tr>
<th>Table 23 indicates that the same percent of radioactive substances of the authorized release level for various types of the Nuclear Power Plants corresponds to various absolute values of emissions. For example, 16 % of radioactive substances of emissions of the New-Voronezh Nuclear Power Plant correspond to 110 TBq, for the Leningrad Nuclear Power Plant - 16 % correspond to 597 TBq (more than by 5 times more). The similar divergence can be tracked also in respect of emissions I - 131, Co - 60, Cs - 134, Cs - 137. Explain, please, whether various annual permissible discharge levels for various types of reactors in the Russian Federation have been established? Whether the standard rates of radioactive substances established in the Russian Federation correspond to the International standards?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 7.4.1 Radioactive gases and aerosols emissions from station</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>In Table 24 there is no information about radionuclide structure of liquid waste.</th>
</tr>
</thead>
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<tr>
<td>Section 7.5.3 liquid radioactive waste</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>One of the tasks of EIA is estimation of the general influence on the population. Unfortunately, the important data are absent in the Report on EIA: the dose for the population in the course of normal exploitation has not been calculated. The detailed information on emissions from various reactors at the Nuclear Power Plants of Russia in water and atmosphere is presented, but the dose for the population caused by emissions from the Belarusian Nuclear Power Plant has been calculated neither for the Belarusian population, nor for the population of the involved countries. Estimation of radiological influence on the population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 15 The forecast of transboundary influence of the Belorussian APS</td>
</tr>
</tbody>
</table>
In the course of normal operation of the new Nuclear Power Plant, supposing emissions of radionuclides, should be presented, and the information on the authorized levels of doses and restrictions should be presented and explained.

Modelling of radioactive pollution being spread in the course of normal operation has not been executed, and transboundary radiological influence of the Belarussian Nuclear Power Plant has not been analyzed.

The scenario of the maximum accidents the reason of which is the project (MDBA) during summer season has been analyzed. The term MDBA has not been defined in the Report. It is not clear what type of failure has been analyzed, and what classes according to INES scale can be applied to it. Also it is not clear why the scenario of MDBA has not been analyzed during winter season. It is necessary to present more information on the initial term of a basis of designing and conservatism peculiar for the given initial term.

In Chapter 5.1 it is necessary to present more detailed information of the initial term concerning the accident which is not connected with design study and conservatism inherent to this initial term. Just as about reliability of a computer code which was used for stimulation of adispersion and deposits of radionuclides. The list and the results of the scenarios of accidents being analyzed should also be presented.

In the course of analysis of estimation of influence of the Nuclear Power Plant on environment in the transboundary context threat of serious accident and corresponding radiological pollution should be presented. On the ground of a direction of movement of air masses in the Report on EIA it has been stated that the part of Lithuania in case of the accident which is not connected with design study will be polluted. More detailed information (illustrating, showing results) of a site of the polluted territories and the levels of the given pollution should be presented.

The results of calculations of pollution in the Republic of Lithuania in case of the accident which was not connected with design study, taking into account South-West emissions, also should be presented. Nevertheless, it is necessary to prove that conservative initial conditions are being taken into considera-
The pollution and doses in Vilnius zone should be presented also with regard to conservative initial conditions. It is not clear how the doses for the population as a result of the emergency accident connected with design study and the accident which has not been connected with design study have been calculated. Which models for calculation of influence on the population have been used? More background information should be presented about estimation of a radiological dose and conservatism inherent for such estimations.

<table>
<thead>
<tr>
<th>Section 14.5.5 Estimated doses of an irradiation at out-of-project accident on the power generating unit</th>
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<tbody>
<tr>
<td>The given information underlines that the risks for Vilnius will exist as a result of soil pollution, which activity will be by 1000 times higher than a natural background. Comparison of emergency maximum design-based emission of radionuclides from the New-Voronezhskaya Nuclear Power Plant-2 and the new Nuclear Power Plant in Belarus is not the reason for the statement that pollution of the territory of Lithuania with radionuclides of the long-term decay after maximum emergency emission at the Belarusian Nuclear Power Plant will be absent. The conclusion has not been proved with congruency. More detailed analysis for authentic substantiation is required.</td>
</tr>
<tr>
<td>Section 15 The forecast of transboundary influence of the Belorussian APS</td>
</tr>
<tr>
<td>Maximum doses at the accidents which are not connected with design study have been calculated, but anywhere in the Report on EIA has not been specified that the risks are admissible. In case if the graphic information on distribution of the doses among the population is presented, it is necessary to present the analysis of the given results and conclusions. Also it is not clear on which directions of movement of air masses the calculations are based. The estimation of Lithuania should be conservative, and the worst scenario should be considered.</td>
</tr>
<tr>
<td>Estimated doses of an irradiation at the maximum design accident on the power generating unit</td>
</tr>
<tr>
<td>Section 14.5.5 Estimated doses of an irradiation at out-of-project accident on the power generating unit</td>
</tr>
<tr>
<td>In Chapter 5.2.4. Influence of tritium and other radionuclides on Neris River (Viliya) in the territory of Lithuania should be estimated.</td>
</tr>
<tr>
<td>The remark is rejected. The reason is explained in the written answer</td>
</tr>
<tr>
<td>The estimation and the conclusion about transboundary influence on health of the population of Lithuania have not been presented, and there is some doubt whether this influence will be insignificant.</td>
</tr>
<tr>
<td>Section 15 The forecast of transboundary influence of the Belorussian APS</td>
</tr>
<tr>
<td>According to IAEA-TECDOC-953, «Methods for...»</td>
</tr>
<tr>
<td>Working Out of the Measures on Reaction to Nuclear and Radiological Accidents the proposed radius of zone for planned urgent protective action amounts to 25 km while in the Report on EIA 20 km are stated. The substantiation of a choice of the given value should be presented.</td>
</tr>
<tr>
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<tr>
<td>In Chapter 5.4.1 of the Report it is specified, that the long-term protective measures based on monitoring of environment and foodstuffs should be carried out within a 300-km zone round the Nuclear Power Plant. If Ostrovets will be chosen as the site for the Nuclear Power Plant, the 300-km zone will cover a considerable territory of Lithuania. In Chapter 7 of the Report the offered ways of organisation of monitoring have been presented only for the territory of Belarus. The Report does not address to a problem on protective measures and monitoring in the neighbouring territory of Lithuania.</td>
</tr>
<tr>
<td>It is very important to take into consideration that the measures on external notification and communication in case of emergency and emergency responses are the subject of the International Agreements of the Government Departments responsible for nuclear safety and radiation protection, protection of the population in emergency situations. The Report on EIA has not specified that the Republic of Belarus has signed the International Agreement in case of emergency situation at the Nuclear Power Plant and indemnification in this case.</td>
</tr>
<tr>
<td>The information on concrete instructions of the International Atomic Energy Agency on nuclear and radiation protection in the course of preparation of the Report on EIA should be presented.</td>
</tr>
<tr>
<td>In the Report on EIA there are no basic geological data: geological maps, geologo-tectonic cross-sections of the new region of the Nuclear Power Plant, the tectonic scheme of the territories being analyzed etc. The estimation of drawbacks and neotectonic vertical changes of ground surface also should be presented in the Report on EIA. Hence, the conclusions concerning geological conditions cannot be shown.</td>
</tr>
</tbody>
</table>
Explain, whether there will be any thermal load on Neris River (Viliya). If yes, in the Report on EIA the dispersion of thermal load and the results should be reflected. The given question is very important since heat pollution can have considerable influence on flora, fauna, especially for hematocryal kinds of benthon and other water organisms of the Neris River (Viliya). Moreover, in the course of preparation of the program of monitoring the given prominent aspect should be taken into consideration. Describe what research should be included in the monitoring program.

Describe in detail what technology will be used for technical water supply from the Neris River (Viliya) to the Nuclear Power Plant. The Report on EIA should include the calculations of water balance of the river and the characteristics of the drains. Consumption of water for cooling of the Nuclear Power Plant and loss of water as a result of evaporation should be calculated. The Report on EIA should include the careful hydrological analysis of the Neris River (Viliya) in two alternative places for surface water intake. The Report should include, at least, average multiannual discharges (average value (Q), Q 80 %, Q 95 % m³/s), and 30-day minimum discharges in summer-autumn and winter time (average value (Q), Q 80 %, Q 95 % m³/s) and ecological discharge. The Report on EIA should present a brief information on the measures which will be taken for ensuring of invariability of thermal and hydrological mode of Neris River so that pollution will not be increased and the quality of water of Neris River (Viliya) will not be worsened.

Exploitation of the planned Nuclear Power Plant can change the hydrological characteristics, thermal conditions and the quality of Neris River (Viliya). Taking into consideration that the Lithuanian part of Neris River (Viliya) is the zone named Nature 2000 created for protection of a salmon, an otter, a lamprey, bitterring and other kinds of fish, and that Lithuania carries out special plans of measures on restoration and protection of the resources of a salmon and kinds of a brook trout, Belarus should guarantee that construction of the Nuclear Power Plant will not worsen the condition of water of Neris River.
According to Article 5 of the Convention on Environment Impact Assessment in a transboundary context (Espoo Convention) of June 18, 2010 in the Department of Energy of the Republic of Belarus transboundary consultations concerning planned construction of the Nuclear Power Plant in the Republic of Belarus have been carried out. The meeting has been conducted by the Belarusian party as the Party of origin.

As agreed between the parties, the Russian language was defined as the working language of consultations.

On the Belarusian party the representatives of the following bodies took part in the consultations:

- Department of Energy of the Republic of Belarus;
- Ministry of Natural Resources and Environmental Protection;
- Ministry of Foreign Affairs;
- National Commission of Belarus on Radiation Protection;
- Institute of Nature Management State Scientific Institution of the National Academy of Sciences of the Republic of Belarus;
- Institute of Radiology Republican Research Unitary Enterprise of the Ministry of Emergency;
- Department of Nuclear and Radiation Safety (Gosatomnadzor) of the Ministry of Emergency;
- Department of Nuclear Power of the Department of Energy;
- Central Scientific and Research Institute of Complex Use of Water Resources Republican Unitary Enterprise» (CSRICUWR);
- “Belnipienergoprom” Republican Unitary Design and Research Enterprise (the basic developer of the documentation on environmental impact assessment);
- Centre of Geophysical Monitoring State Enterprise of the National Academy of Sciences of the Republic of Belarus;
- Nuclear Power Plant Board of Directors.

On the Lithuanian party the representatives of the following bodies took part in the consultations:

- Ministry of Environment;
- Environmental Protection Agency (EPA);
- Commission on Environmental Protection of the Seim of the Republic of Lithuania;
- Ministry of Foreign Affairs;
- Department of Energy;
- Institute of Physics;
- State Inspectorate on Nuclear Safety.

At the beginning of the meeting the Belarusian party has presented the first three reports with the presentations concerning the planned project of the Nuclear Power Plant.

The first Report has been made by the Director of Belnipienergoprom Unitary Enterprise and contained the information on the power system of the Republic of Belarus, on the necessity of development of the nuclear-power engineering in the Republic of Belarus and on substantiation of a choice of the Ostrovets site for construction of the Belarusian Nuclear Power Plant.

The necessity of construction of the Nuclear Power Plant in the Republic of Belarus is caused first of all by the existing situation in the field of power engineering, in the field of support of the supply-demand balance and the necessity of solution of power engineering problems for further sustainable development of the Republic.

Construction of the Nuclear Power Plant in Belarus was planned in the eightieth years of the last century. In connection with the accident at the Chernobyl Nuclear Power Plant the project has been stopped.

In 2006 research on selection of the site for a new Nuclear Power Plant have been renewed. 74 sites of possible location of the Nuclear Power Plant have originally been considered. After studying of the available materials as well as other factors of research (including presence of transport corridors) and studies of provision with the resources have been finally defined four the most perspective sites of location of the Nuclear Power Plant: Krasnopolyansk, Kukshinovsk, Verkhnedvinsk and Ostrovets. After conducting of detailed geological research it has been revealed that at two first sites there is a potential possibility of activization of suffosion-karstic processes in the available dolomite and limestone depositions which can lead to decrease in stability of soil. In connection with the above-mentioned the site located in the northwest of Belarus in the centre of the Ostrovets district, Grodno region has been recognized as the priority site for construction of the NPP.

The second Report has been made by the Chairman of the National Commission of Belarus on Radiating Protection.

The information on estimation of influence of an ionizing radiation on the population of the Republic of Belarus and the neighbouring countries, as in case of power plant operation in a regular mode as well as in case of emergencies has been presented. The submitted estimate showed that at normal operation of the object it will not represent any risk for health and life of the population of the Republic of Belarus and the Republic of Lithuania. The annual dose of an irradiation of the population of the frontier areas of Lithuania and the city of Vilnius at normal operation of the Belarus Nuclear Power Plant will amount to 0,017 μSv and 0,004 μSv accordingly. In case of occurrence of out-of-design-basis accident the effective dose of an irradiation at a distance of 100 km can amount to 0,438 mSv.

At carrying out of protective measures at out-of-design-basis accident the following zones of reaction and planning on population protection are being allocated: a zone of precautionary protective measures (3 - 5 km); a zone of planning of urgent protective measures (25 km); radius of planning of introduction of restrictions on foodstuff (300 km).

The third Report has been made by the representative of Institute of Radiology Republican Research Unitary Enterprise.
The speaker has presented the information on estimation of radiation influence on agroecosystems of the Belarusian Nuclear Power Plant at regular operation and in case of emergencies. The forecast of pollution with radio nuclides of the basic components of agroecosystems has been carried out and estimation of the doses of ionizing radiation has been executed.

At operation of the Nuclear Power Plant within 60 years the maximum density of pollution of soil will not exceed 15 Bq/m which is less than 1% in comparison with the existing level.

Activity of $^{90}$Sr in regular fallouts amounts to some Bq/day, therefore its contribution to soil and foodstuffs pollution is negligible (approximately $10^{-5}$ Bq/m$^2$).

The additional content of $^{137}$Cs in the investigated kinds of agricultural products is being predicted at a level of $10^{-4}$-$10^{-2}$ Bq/kg which amounts to less than 2% of the existing pollution.

The content in beef and milk at use of the forages prepared on peat soils and grasses of natural pastures will not exceed $10^{-2}$ Bq/kg, in grain, root crops and tuber crops - less than $10^{-4}$ Bq/kg.

After representation of the above-mentioned reports the Lithuanian party focused attention at the fact that in the course of presentation the Lithuanian party has received the additional information and has been noted about necessity of more careful studying of the new information and carrying out of new public discussions for Lithuania.

The Belarusian party has assured that anything essentially new on construction of the Belarusian Nuclear Power Plant has been presented in the presented information on building of the Belarus Nuclear Power Plant as compared has been earlier given the Lithuanian party for studying and discussion. The material is represented only in more developed kind with regard to replies to the questions which have been put earlier. All presented initial data and the results of calculations are the same. The Belarusian Party also has noticed that it does not accept the offer of the Lithuanian Party on carrying out of the new public discussions in Lithuania because Belarus has executed all necessary procedures provided by Espoo Convention. At that it has been noticed that if the Lithuanian party has a necessity of further studying of the materials of EIA and conducting of the works with the public, it is the right of Lithuania.

In the course of consultations the Belarusian Party has presented two more Reports with presentations.

One of the Reports has been made by the representative of the Institute of Nature Management State Scientific Institution and contained the information on geological, hydrological, geophysical, geodetic substantiations of a choice of the Ostrovets site as the priority site for construction of the Belarusian Nuclear Power Plant.

The given Report has been presented in reply to the question of the Lithuanian Party on why namely the Ostrovets site has been chosen for construction of the Belarusian Nuclear Power Plant.

According to the available engineering (geological, geophysical etc.) research conducted at four various sites the Ostrovets site, the only site which does not have forbidding geological factors for placement of the Nuclear Power Plant - is not located on tectonically active fractures, the presence of active karst has not been revealed, and there is no possibility of activization of suffosion-karstic processes.

The next Report has been presented by TSNIKIVP RUE on influence of the Belarusian Nuclear Power Plant on surface water, in particular on a hydrological regime of River Viliya, and then the Belarusian Party answered the questions of the Lithuanian
Party on influence (hydrological, chemical, thermal) of the Nuclear Power Plant on River Viliya.

The Belarusian Party has given the well-reasoned replies to all the questions of the Lithuanian Party including on carrying out of monitoring, on handling of radioactive waste (liquid and solid) and spent nuclear fuel, on control of the Nuclear Power Plant operation (about regulating and supervising body), on professional training, on carrying out of examination and licensing.

During consultations the Lithuanian Party repeatedly brought up a question on criteria of a choice of the Ostrovets site as the priority site for construction of the Belarusian Nuclear Power Plant.

The Belarusian Party has underlined that the task to place the Belarusian Nuclear Power Plant at the Ostrovets site was not put deliberately. On the contrary, originally the priority was given to the Kukshinovsk site in Mogilev region.

Upon termination of the consultations it was stipulated that the Lithuanian Party will present to the Belarusian Party within two-week term its position by the results of the conducted consultations. Also it has been noticed that the Lithuanian Party insists on the necessity of studying additional materials of EIA and carrying out of new public discussions in Lithuania with participation of the representatives of the Belarusian Party.

The Belarus Party has noticed that it does not see expediency of carrying out of the new public discussions in Lithuania with participation of the Belarusian Party since the Report on EIA sent to the Lithuanian Party in modified version does not contain any new information on influence on environment. The Report on EIA modified with regard to the proposals of Lithuania and the decision on approval of substantiation of investment (the component of which is the Report of EIA), will be sent without fail to the Lithuanian Party.

The Report has been signed:

On the Belarusian Party: A.Andreev
On the Lithuanian Party: V.Auglis

Secretary V.Kovalenko

I hereby certify the authenticity of the translation with the original document. Translator V.P.Komarova
2.6 Republic of Latvia

2.6.1 Responses on the remarks and proposals of the Department of the Environment of the Latvian Republic.
Remark 1: The documentation about the influence on the environment does not contain a qualitative and quantitative estimation of the possible radiation contamination which may influence on the territory of Latvia in case of the accident. Such an evaluation is required for the estimation of the conditions of the probability of the worst scenario and the unfavorable meteorological conditions.

Response: The dose limits and the special purpose probability factors, fixed for the energetic block of the Nuclear Power Plant – 2006, completely correspond to the requirements of the present-day Russian «НД», the recommendations and the safety norms IAEA, the International consultative group on nuclear safety (INSAG 1 – INSAG 12) and the requirements of the European operational organizations to the projects of the atomic stations of the new generation with the reactors of type PWR. The table P.24 presents – for the comparison – the special purpose indices of the radiation and nuclear safety of the energetic block of the increased safety for different projects of Nuclear Power Plants and the requirements to them.

Table P.24 – The indices of the radiation and nuclear safety of the Nuclear Power Plant

<table>
<thead>
<tr>
<th>Criterion</th>
<th>EUR INSAG - 3</th>
<th>«НД РФ»</th>
<th>Project «NPP – 2006»</th>
<th>Project USA – AP WR</th>
</tr>
</thead>
<tbody>
<tr>
<td>The quota of radiation of the population in the result of blows – out (drops) at «SO NPP»</td>
<td>Not regulated</td>
<td>50 (50)</td>
<td>10 (10)</td>
<td>-</td>
</tr>
<tr>
<td>The quota of radiation of the population in the result of blows – out and drops at «SO» taking into account «SO NPP», mkSu/year</td>
<td>100</td>
<td>Not regulated</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>The effective dose on the population in case of the projected accidents, mSv/event. - with the frequency of more than (10^{-4}) 1/year</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>- with the frequency less than (10^{-4}) 1/year</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>The effective dose on the</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion</td>
<td>EUR INSAG - «НД РФ»</td>
<td>Project «NPP – 2006»</td>
<td>Project USA – APWR</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>population in case of the projected accidents, mSv/year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The probability of a serious breakage of the active zone, 1/year, reactor</td>
<td>1E - 5</td>
<td>1E - 5</td>
<td>1E – 6</td>
<td></td>
</tr>
<tr>
<td>The probability of large blows – out for which it is necessary to take quick countermeasures outside the ground, 1/year, reactor</td>
<td>1E - 6</td>
<td>1E - 7</td>
<td>1E - 7</td>
<td></td>
</tr>
</tbody>
</table>

The table P.25 gives – for the comparison the calculated values «MAE» and the requirements to them fixed in different countries and projects. The realization in the projects of the planned strategy lowered the calculated levels of «MAE» grounded according to the above indicated requirements.

**Table P.25 – The maximum admissible accident blows – out («MAE») and the requirements to them, «TBk».

<table>
<thead>
<tr>
<th>Dose forming nucleid</th>
<th>Requirements to the location of NP, USSR, 1987</th>
<th>Requirement of the state council of Finland 395/91</th>
<th>Tyanvan NPP</th>
<th>Project NPP «NPP – 2006»</th>
<th>USA APWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xenon – 133</td>
<td>Not regul.</td>
<td>Not regul.</td>
<td>10^6</td>
<td>10^5</td>
<td>3 x 10^5</td>
</tr>
<tr>
<td>Jodine – 131</td>
<td>Not more than 1000</td>
<td>Not regul.</td>
<td>600</td>
<td>100</td>
<td>349</td>
</tr>
<tr>
<td>Cesium – 137</td>
<td>Not more than 100</td>
<td>Not more than 100</td>
<td>50</td>
<td>10</td>
<td>5.6</td>
</tr>
<tr>
<td>Strontium – 90</td>
<td>Not regul.</td>
<td>Not regul.</td>
<td>1</td>
<td>0.12</td>
<td>0.15</td>
</tr>
</tbody>
</table>

* The requirement was excluded when the document was issued. The document «ПНАЭГ – 03 – 33 – 93», «НП – 032 – 01» harmonizes the requirements of the Russian «НД» with the recommendations of IAEI (INSAG – 3): the measures for the control and the reduction of the consequences of the serious accidents should reduce the probability of large blows – out outside the probability of large blows – out outside the limits of the ground, for which quick countermeasures are necessary outside the ground with the level of 10^{-7} 1/year reactor.
The table P.26 shows the quantitative and the qualitative composition of the exhaust in case of a serious «NDBA», used to estimate the radiological consequences in case of a accident at the Belorusian Nuclear Power Plant.

Table P.26 – The exhaust of radionucleoids into the environment, Bk.

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Activity Bk</th>
<th>Radionuclide</th>
<th>Activity Bk</th>
<th>Radionuclide</th>
<th>Activity Bk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kr – 8.5</td>
<td>1.00E + 13</td>
<td>Kr – 85m</td>
<td>4.2E +14</td>
<td>Kr – 84</td>
<td>8.4E +14</td>
</tr>
<tr>
<td>Kr – 88</td>
<td>1.2E + 15</td>
<td>Sr – 89</td>
<td>3.9E +13</td>
<td>Sr – 90</td>
<td>1.5E +12</td>
</tr>
<tr>
<td>Sr – 91</td>
<td>4.60E + 13</td>
<td>Y – 91</td>
<td>3.30E +12</td>
<td>Mo – 99</td>
<td>1.80E +13</td>
</tr>
<tr>
<td>Te – 99m</td>
<td>1.80E + 13</td>
<td>Ru – 103</td>
<td>1.20E +13</td>
<td>Ru – 106</td>
<td>2.70E +12</td>
</tr>
<tr>
<td>Sb – 127</td>
<td>1.2E + 13</td>
<td>Sb – 129</td>
<td>6.9E +13</td>
<td>Te – 129m</td>
<td>1.1E +13</td>
</tr>
<tr>
<td>Te – 131m</td>
<td>2.5E + 13</td>
<td>Te – 132</td>
<td>2.5E +14</td>
<td>I – 131</td>
<td>4.1E +14</td>
</tr>
<tr>
<td>I – 132</td>
<td>5.8E + 14</td>
<td>I – 133</td>
<td>8.3E +14</td>
<td>I – 134</td>
<td>9.2E +14</td>
</tr>
<tr>
<td>I – 135</td>
<td>7.3E + 14</td>
<td>Xe – 131m</td>
<td>1.7E +13</td>
<td>Xe – 133</td>
<td>3.0E +15</td>
</tr>
<tr>
<td>Xe – 133m</td>
<td>1.1E +14</td>
<td>Xe – 135</td>
<td>5.8E +14</td>
<td>Xe – 138</td>
<td>3.0E +15</td>
</tr>
<tr>
<td>Cs – 134</td>
<td>2.6E + 13</td>
<td>Cs – 136</td>
<td>1.0E +13</td>
<td>Cs – 137</td>
<td>1.70E +13</td>
</tr>
<tr>
<td>Ba – 140</td>
<td>8.8E + 13</td>
<td>Za – 140</td>
<td>4.40E +12</td>
<td>Ce – 144</td>
<td>1.2E +13</td>
</tr>
<tr>
<td>Np – 239</td>
<td>2.3E + 14</td>
<td>Rb – 88</td>
<td>1.2E +15</td>
<td>Rh – 106</td>
<td>2.7E +12</td>
</tr>
<tr>
<td>Te – 129</td>
<td>1.10E + 13</td>
<td>Xe – 135m</td>
<td>1.2E +14</td>
<td>Ba – 137m</td>
<td>1.70E +13</td>
</tr>
<tr>
<td>Pr – 144</td>
<td>1.2E + 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The comparison of the data of the tables and «МАЕ ІАЭС – 2» shows that a more powerful exhaust was used in calculations for iodine – 131 -4 times, for cesium – 137 – 1.7 times and for strontium – 90 – 10 times. The results of the calculation have shown that the maximum calculated dose of irradiation of the thyroid gland, at the given scenarios of «NDBA», will exceed the criteria of the interference 50 mSv during the first seven days after the accident at the distance of up to 25 km from the Plant, hence, in the radius of 25 km from the Plant the necessary countermeasure will include the iodine prophylaxis at the early stage. As for as the distance from the Nuclear Power Plant to the border of the Latvian Republic is 110km, it follows that there will be no consequences for the Latvian Republic in case of the accident at the Belarusian Nuclear Power Plant.

Remark 2: We consider it is necessary to discuss the problems of monitoring and control in more details, and also to describe in more details the information about the system of the preliminary warning and about the international cooperation, especially in the case of a accident in order to receive a more effective flux of information and to control the risks.

Response: the answer to this question is given in the point d) in the answer on the remark of the Republic of Poland.

In addition we can inform that in accordance with the “Technical protocol” of the Ministry of the natural resources and the guarding of the environment of the Republic of Belarus and the Ministry of the Environment of the Latvian Republic about the cooperation in the field of monitoring and the exchange of information about the state of the trans – boarder surface waters from the 10th of April 2008, at present the trans – boarder monitoring on the hydro chemical indices at the transborder rivers Vilija (settlement Bystritsa) on the Belorusian territory and at the river Njaris (settlement Buividz-
Besides, the interlaboratory comparisons of the results of measuring the contents of the chemical contaminating substances are conducted.

The Belorusian side has prepared the proposals for conducting the radiation monitoring at the same alignments and the interlaboratory comparisons in the frames of the above mentioned “Technical protocol”.

Remark 3: We also consider it necessary to discuss in more details the problems of the used nuclear fuel and the control of the radioactive wastes.

The conclusion about the influence on the environment must contain more extensive information about the supposed actions on storing the radioactive wastes, their disposition and control, and not only the description of possible or supposed variants.

Response: In “EIA” of the Belorusian Nuclear Power Plant, the problem of treatment of the radioactive wastes is discussed in the section 7.5.2. The section contains the classification the radioactive wastes, the description of the technology of treating various radioactive wastes used in the project of the Nuclear Power Plant – 2006, is given the guiding information about the radioactive wastes, liable to retreatment and storing at the Nuclear Power Plant; it is shown that the final volume of hard wastes (after the retreatment and not liable to the retreatment) does not exceed the value of 50m$^3$/year from one unit. The section describe the storage of hard radioactive wastes at the Plant.

The problem of treating the nuclear fuel at the territory of the ground of the Nuclear Power Plant is described in the section 8 of “EIA” of the Belorusian Nuclear Power Plant.

The problems of treating the radioactive wastes and the nuclear fuel outside the ground of the Nuclear Power Plant are not the subject of “EIA” of the Belorusian Nuclear Power Plant.

As for your question concerning Verkhnedvinsky settlement, we inform you that on the basis of the works carried out at the stage of choosing the ground for the Belorusian Nuclear Power Plant it was decided that in total of essential factors the Ostrovetsk ground is prior (main), and Krasnopolyansk and Kukshinov grounds are reserve.

4 Responses on the remarks and proposals of the Radiation safety Department of the Latvian Republic

Remark 4: - In text of WTS there are the results concerning only the neighbouring state – the Lithuanian Republic. But there are no quantitative data concerning the Latvian Republic, the borders of which are at a comparatively small distance - at the distance of 110Km from the Nuclear Power Plant.

- Latvia needs the information about the maximum supposed radiological contamination on the territory of Latvia in case of the accident on the above named Nuclear Power Plant, especially in case of unfavorable meteorological conditions.

Response: In “EIA” two scenarios of different weather conditions at the moment of maximum concentrations of radionuclides in the atmosphere. This leads to a diametrically different character of the settling on the surface of land:

– the first scenario was characterized by a relatively low velocity of the wind and by moderately stable state of the atmosphere; this to the settling of a large quantity of
the radioactive substances (up to 20000 kBk x m$^2$ by the axis of the trace) at a relatively small territory (several thousands of hectares);

– the second scenario was characterized by high – speeds of displacement of the air mass with a moderate fluctuation, and this caused the formation of large areas (many hundreds of hectares) of fields of radioactive contamination with a relatively small surface activeness (0.5 – 37 kBk x m$^2$).

The following values of the exhaust were taken for modeling: iodine – 131 = 3.1 x 10$^3$ TBk and cesium – 137 + 3.5 x 10$^2$TBk, which is higher «MAE» for the Nuclear Power Plant – 2006 by the iodine in 31 times, and by cesium - in 35 times. Even at these values of exhaust, the maximum density of the contamination of the territory – at the worst weather conditions made up, by cesium – 137 1.9 x 10$^5$ Bk/m$^2$ (5.1 KU/m$^2$) at the distance of 30 km from the Plant.

Hence, we consider that there is no sense to calculate the density of the contamination at the distance of 110km.

Remark 5. In the text of “EIA” there is not enough information about observing such an important international requirement as the operative warning about an accident or an incident, about the readiness to react and the reliable work of the warning system.

Response: The procedure and the system of quick warning of the neighboring countries in case of the accident is worked out by the competent organizations as a part of the project of the Belorusian Nuclear Power Plant and is not an object of “EIA”. It should be noted that the named procedure must provide the carrying out of the obligations taken by the Republic of Belarus in the frames of the treaty “The Government of the Republic of Belarus, the Government of the Republic of Poland on the 26th of October, 1994”, “The Treaty between the Government of the Republic of Belarus and Government of the Republic of Poland about the operative warning about the nuclear accidents and the cooperation in the field of the radiation security” and “The Agreement between the Government of the Republic of Belarus and the Cabinet of Ministers of Ukraine about the operative warning about the nuclear accident and the cooperation in the field of the radiation security. Entered into force on the 16th of October, 2001”.

Remark 6. It is not specified, what conditions are used for choosing three possible places liable for examining as variants for choosing an optimum ground for locating the Nuclear Power Plant.

Response: the detailed information about the competitive grounds (Krasnopolyanskaya, Kukshinovskaya, Ostrovetskaya) is represented in the summary volume on the set of research and investigating works for choosing the ground for locating the atomic station in the Republic of Belarus («1588 – ПЗ – ОИИЗ». General explanatory note. Part I).

The choice of the ground for locating the nuclear object is a multifactor task connected with the taking into account the influence of the environment on the nuclear object on the environment. The safety of the Nuclear Power Plant, the radiation security of the population and the guarding of the environment in the region of the atomic power station in case of the normal operation and taking into the account the projected and extra – projected emergency situations along with the technical facilities and the organizational measures are provided by the choice of the favorable location for the Nuclear Power Plant and its proper remoteness from the populated areas, the industrial enterprises, the objects of culture and health services, etc. Thus, when taking the decisions
about the suitableness of the ground for locating the Nuclear Power Plant, the following factors were taken into account:

– connected with the influence of the Nuclear Power Plant on the environment and the radiation security of the population;
– stipulated by the events and actions, connected with the activity of people;
– connected with the influence of the natural conditions on the safety of the Nuclear Power Plant.

The criteria of the comparison

The choice of the priority ground was conduct on the basis of the analysis of the competitive grounds according to the chosen criteria of comparison, by the following directions;

- the correspondence to the requirements of the normative documents of the Republic of Belarus and the recommendations of IAEA;
- the natural and technologenous factors;
- the social and demographic factors;
- the ecological factors, including the radiation contamination;
- the technical and economic factors.

Question 4. There is insufficient experience of the operation because other reactors of the similar type are only in the stage of constructing.

Question 5. There is insufficient analysis of the reason, why just this type of the reactor was chosen. It is probable, that the choice, to a great extent, was influenced by the experience of using the technologies of the Russian Federation, and also possible economic, not technical considerations.

Response: Out of PWR of the reactors of the generation III+, the world market proposes:

- AP – 600, 1000 (the USA and Japan);
- EPWR – 1600 (France and Germany);
- «NPP – 2006» (Russia).

The project AP – 600 and AP – 1000 exists only on the paper, it is not constructed anywhere.

The project EPWR – France is constructing the first Nuclear Power Plants during 15 years in Finland and France.

The project «NPP – 2006». Russia is the only country that is actively constructing the Nuclear Power Plants with «PWR – 1000» abroad during the last ten years: China, India, Iran, Bulgaria. Some stations are put into operation: Rostov Nuclear Power Plant in 2001, Kalinin Nuclear Power Plant in 2005, the Nuclear Power Plant “Temelin” in 2001 and 2002, Tyanvan Nuclear Power Plant in 2007. The closest prototype of the project of the Nuclear Power Plant – 2006 was put into the commercial operation in 2007, in China (2 energetic blocks). By the Russian projects of the third generation the construction of two blocks in India is coming to an end, the construction of two blocks was started in Belgaria and of four blocks – in Russia.

As for the Tyanvan Nuclear Power Plant, 223.09.2009 in Lyanjungan (China), the talks between ATOMSTROYPROJECT, CJSC (NPP, CJSC) and Tszyansun nuclear power corporation (JNPC) took place, in connection with the termination of the term of the guaranteed operation of the second block of the Tyanvan Nuclear Power Plant.

The sides signed the joint “Protocol of the negotiations on the questions of the find acceptance of the block 2 “TNPP”, in accordance with which the two – year period of
the guaranteed operation of the second block of the Tyanvan Nuclear Power Plant is considered completed. The protocol was signed, on the Russian side, by the first vice – president of ATOMSTROYPROJECT, CJSC Alexander Nechaev, on the Chinese side – the general director of JNPC Tszyan Gouan.

The similar protocol of the final acceptance after the completion of the guaranteed period of operation of the first block of the station was signed in June of this year.

The guaranteed period of work demonstrated the reliable operation of the station. Both the energetic blocks of the Tyanvan Nuclear Power Plant operate stabely at the level of the nominal contract power of 1060 MWt and have high technical and economical indices. Since the moment of the start of the first two blocks, the station worked out more than 30 mlrd kWt x hour of electric power. The Tyanvan Nuclear Power Plant, constructed by the modified Russian project, is the most safe among the stations operating in the Chinese People’s Republic.

The proposed projects of the Nuclear Power Plants with the reactors of the generation III+ have the comparable indices by the reliability, the frequency of the maximum emergency exhausts, etc. It should be admitted that a definite role was played by the experience of using the technologies of the Russian Federation, the community of the language, of the technical requirements, etc. However, the major role in choosing the project played the problems of the safety of the Nuclear Power Plant.

Question 6. There is little information about the quantity of radioactive wastes and exhausts into the environment just from this type of the reactor.

Reponse: The table P.27 contains the data on the quantity of the fuel radioactive wastes going for the retreatment and the further storing to the building for the retreatment of the low – active wastes from the two blocks of the Nuclear Power Plant – 2006.

Table P.27 – the quantity of the fuel radioactive wastes going for the retreatment and the further to ring to the building for the retreatment of the low – active wastes from the two blocks.

<table>
<thead>
<tr>
<th>Name of wastes</th>
<th>Place of formation</th>
<th>Quantity of wastes from two blocks going to the building “00UKS”, m³/year (at normal operation, “TO” and repairs (at accidents))</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Low – active fuel radioactive wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1. Burning</td>
<td>Buildings of the zone of the controlled access</td>
<td>220 (110/110)</td>
<td></td>
</tr>
<tr>
<td>1.2. Non-burning</td>
<td>Buildings of the zone of the controlled access</td>
<td>130 (65/65)</td>
<td></td>
</tr>
<tr>
<td>1.3. Metal</td>
<td>Buildings of the zone of the controlled access</td>
<td>20 (5/15)</td>
<td>50% for grinding</td>
</tr>
<tr>
<td>1.4. «ТЭН»</td>
<td>“PO”</td>
<td>1.0</td>
<td>50% for grinding</td>
</tr>
<tr>
<td>Name of wastes</td>
<td>Place of formation</td>
<td>Quantity of wastes from two blocks going to the building “00UKS”, m³/year (at normal operation, “TO” and repairs (at accidents))</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>1.5. Filters</td>
<td></td>
<td>(1/-)</td>
<td></td>
</tr>
<tr>
<td>1.5.1. Non – burning, pressed</td>
<td>Buildings of the zone of the controlled access</td>
<td>32</td>
<td>Once in two years</td>
</tr>
<tr>
<td>1.5.2. Burning</td>
<td>Buildings of the zone of the controlled access</td>
<td>36</td>
<td>Once in two years</td>
</tr>
<tr>
<td>1.5.3. Hardened wastes</td>
<td>Building of the technological, control systems of normal operation and special water purifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Average – active fuel radioactive wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1. Metal</td>
<td>Buildings of the zone of the controlled access</td>
<td>10 (10/-)</td>
<td>90% for rettreatment</td>
</tr>
<tr>
<td>2.2. Other wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.1. Burning</td>
<td>Buildings of the zone of the controlled access</td>
<td>23 (11.5 / 11.5)</td>
<td>90% for rettreatment</td>
</tr>
<tr>
<td>2.2.2. Nn - burning</td>
<td>Buildings of the zone of the controlled access</td>
<td>54 (54/-)</td>
<td>90% for rettreatment</td>
</tr>
<tr>
<td>2.3. Filters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3.1. Non - burning</td>
<td>Buildings of the zone of the controlled access</td>
<td>75</td>
<td>Once during the period of operation (50 years)</td>
</tr>
<tr>
<td>Name of wastes</td>
<td>Place of formation</td>
<td>Quantity of wastes from two blocks going to the building “00UKS”, m³/year (at normal operation, “TO” and repairs (at accidents))</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>2.3.2. Burning</td>
<td>Buildings of the zone of the controlled access</td>
<td>87</td>
<td>Once during the period of operation (50 years)</td>
</tr>
<tr>
<td>2.4. Hardened wastes</td>
<td>Building of the technological, control systems of normal operation and special water purification</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td>2.5. Hardened wastes of waters of the special wash – house and the set for burning</td>
<td>Building for retreatment and storing the radioactive wastes</td>
<td>16.8</td>
<td></td>
</tr>
<tr>
<td>3. Highly – active fuel radioactive wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1. Intra – reactor detectors</td>
<td>“PO”</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>3.2. Units of detecting</td>
<td>“PO”</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

The final volume of the hard wastes (after the retreatment and not liable to retreatment) does not exceed 50m³/year from one block.

The final volume of the hard wastes (after the retreatment and to liable to retreatment) does not exceed 50m³/year from one block. The real exhausts and drops of the radioactive substances from the Nuclear Power Plant with the reactors «PWR – 1000» are listed in “EIA” of the Belorusian Nuclear Power Plant according to the data of the “Annual report about the activity of the federal service on ecological, technological and atomic supervision in 2005”. Here is also indicated the portion of the exhausted and dropped radionucleids with respect to the fixed «СПАЭС – 03» values.

Question 7. The analysis of the information is complicated because there is of ten no references on the sources of literature ..... 

Response: We agree with this remark. In the final wording “EIA” of the Belorusian Nuclear Power Plant, this drawback is removed.
Question 8. The reference at page 93 to the computer program MULTIBOX and the comparison of its results with other programs for analyzing the migration of radionucleids is not sufficiently grounded, because for the checking of the model and the system, the data about the temporary storages of the radioactive wastes, the initial information of which contains a large mistake, are used, - at the same time there is no ground to affirm that the system of supporting the given decision within the limits of the mistake is as reliable as many others, more tested.

Response: The program complex MULTIBOX describes a multi – cavity model with a variable cell, in the base of which the method of system analysis lies. This type of models has found wide use both in solving the practical migration and hydrogeological problems for the operational predictions, and in solving complicated problems of spreading the radionucleids in the lithosphere, hydrosphere, biosphere in the native and international practice. The model and computing programs MULTIBOX were tested by comparing the results of the computations by the international programs such as DUST, GWSCREEN, AMBER, ECOLEGO. The international models DUST, AMBER, ECOLEGO, that also are multi – cavity models, are recognized, approved and widely used at the international standard.

The verification and the approvement of the model MULTIBOX was carried out on the basis of comparing the calculated and experimental researches conducted at the points of the burial of the wastes of the deactivation of the Chernobyl origin, which were examined, certified and were controlled during 10 years. This model proved itself well also when examining the profiles of the contaminations of the soil layers in the result of the migration of the radionucleids on the territories contaminated by radionucleids in the result of the Chernobyl and global exhausts.

The satisfactory consent of the results of the computations by the model MULTIBOX and international models, and also with the data of the field researches, gives grounds to apply the developed model to the evaluation of the potential danger of the radioactive contamination of the underground waters in the cases of the local and area sources of contamination in the zone of the observation of the planned Nuclear Power Plant at the stage of investing its construction.

The received conclusions on the calculated researches, made on the basis of using the developed models, coincide with the conclusions of the Russian geological expeditions, that, during the last twenty years, actively carry out the geological researches in the regions adjacent to the operating Nuclear Power Plants (Smolensk, Kursk, Novovoronezh, Kalinin, Leningrad). The main direction of these researches was to find out, by the geolchemical methods, the influence of the atomic power objects on the natural environment in the 30 – km zones of the Nuclear Power Plants. The main content of these conclusions is that, at standard functioning of the Nuclear Power Plants, a rather favorable situation is provided on the territories adjoining them. The standard methods of control of the radiation situation in the environment do not permit, in the majority of cases, to detect the influence of their activity.

Question 9. There is no grounding for the scenario at page 94 – how the boundary conditions were chosen – 15m³ and 600 ki of the liquid radioactive wastes, the influence of which is then analyzed, and the isotopic composition of the waste is not characteristic of the reactors of the type «PWR».

Response: The hypothetical scenario of the local source of the contamination of the underground waters was synthesized on the basis of the analysis of the emergency situations at the operating Nuclear Power Plants in Russia, that caused the local con-
tamination of the geosphere at the grounds of the Nuclear Power Plants. (Kuznetsov V.M. "The general problems and the modern state of safety of the enterprises of the nuclear fuel cycle of the Russian Federation", 2002). As a example, the incident was considered which took place at Beloyarsk Nuclear Power Plant, when at the Plant of pumping the liquid radioactive wastes, the room for servicing the pumps of the storage of the liquid radioactive wastes was flooded. The liquid radioactive wastes passed into the securing tray and, because of the absence of the tightness, and because of the overfilling of the tray, got into the ground under the storage of the liquid radioactive wastes and then – into the cooling reservoir. The total quantity of the liquid radioactive wastes accumulated in the tray, made up 15m³. Other characteristics of the liquid radiotechnical wastes (the isotope composition, the specific activity of the radioisotopes, the summary activity of the exhaust, etc.) because of the absence of the reference information, were formed from different sources. The calculations on the given scenario were made only purpose to evaluate the protection of the underground waters against the radioactive contamination in the zone of the influence of the Nuclear Power Plant and to develop later the system of the system of the radiation monitoring and the measures for preventing the spreading of the radioactive contamination in the water – carrying horizons in the emergency situations.

Question 10. At page 96, the analysis of the epidemiology is made by means of using the data about the Belarusian people only, and the planned location of the Nuclear Power Plant is situated at 40 km only from Vilnijus – therefore the analysis should be made for the population of the neighbouring countries.

Response: The authors of “EIA” had at their disposal only the information on the population of the territory of Beluarus.

Question 11. At page 110, there is no correspondence of the and the location of the object on the map.

Response: At page 110, a drawing is given, and not a map, therefore the scale is not observed.

2.6.2 Ответы на комментарии, полученные при проведении Консультаций

Comment 1. Today the web-site of the Directorate for the Construction of the Nuclear Power Plant (www.dsaе.by) contains the EIA Report dealing with the Belarusian NPP project including parts as follows:

Part 1. Description of the NPP;
Part 2. Current state of the environment;
Part 3. Nuclear Power Plant environmental impact assessment;
Annex A. Preliminary EIA Report public discussion minutes;
Annex Б. Answers to questions and observations by countries concerned, non-governmental organisations, work collectives and individuals participating in the Belarusan NPP environmental effects discussion.

The Republic of Belarus will also provide access to the EIA Report documents which have been formed in accordance with the EIA transborder procedures. This is done in keeping with Article 6 of the Espoo Convention stating that countries concerned should be kept informed of the project progress by the NPP construction planning country.
Comment 2. As indicated in Comment 1 herein, we welcome your comment and accept it. As is required by the procedures of informing the neighbour countries of the transborder environmental situations, we’ll provide access to the final decision resulting from the EIA updated Report. Moreover, we’ll take the necessary steps to evaluate the probability of NPP construction effects on the territory of the Republic of Latvia and mitigation of these effects as far as possible.

Comment 3. We fully share with you the concerns regarding spent nuclear fuel and radioactive waste management and are of an opinion that at the stage where we are now these issues have been sufficiently well dealt with in the EIA Report. A more detailed approach to the issues will be elaborated in the process of engineering design preparation. In this context, we’ll proceed in accordance with the IAEA and national legislation provisions.

Comment 4. In conformity with the provisions of the Belarus legislation and international standards, we intend to establish a system of local environmental monitoring around the Belarusian NPP, which will make part of the national environmental monitoring system. Access to the data obtained during actual monitoring will no doubt be easily available, as is stipulated by the legislation of the Republic of Belarus in the field of environment protection. Furthermore, should you wish to have firm guarantees of the access and draw a relevant bilateral agreement, we are prepared to look at the possibility of drafting it.

Comments 5 and 6. We kindly inform you that the Republic of Belarus has ratified the Convention on Early Notification of a Nuclear Accident as well as the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency signed in Vienna on 26 September 1986. The Ministry for Emergency Situations of the Republic of Belarus has assumed responsibility for following the provisions of the Conventions and operates as a liaison office.

Besides, in keeping with the Republic of Belarus legislation on nuclear energy use, an internal and external emergency situation activities plan containing adequate control and response measures is to be elaborated prior to NPP commissioning.

On the other hand, in order to raise the efficacy of an early notification system and assistance in case of a nuclear accident and emergency radiological situations, we support the idea of considering the issue of drawing a relevant bilateral international treaty (agreement). We have already submitted a relevant proposal to the authority concerned — Ministry for Emergency Situations of the Republic of Belarus.

2.6.3 The account of remarks received from Republic Latvia during EIAP procedure of the Belorussian APS

Table P.28
The documentation about the influence on the environment does not contain a qualitative and quantitative estimation of the possible radiation contamination which may influence on the territory of Latvia in case of the accident. Such an evaluation is required for the estimation of the conditions of the probability of the worst scenario and the unfavourable meteorological conditions.

We consider it is necessary to discuss the problems of monitoring and control in more details, and also to describe in more details the information about the system of the preliminary warning and about the international cooperation, especially in the case of a accident in order to receive a more effective flux of information and to control the risks.

We also consider it necessary to discuss in more details the problems of the used nuclear fuel and the control of the radioactive wastes. The conclusion about the influence on the environment must contain more extensive information about the supposed actions on storing the radioactive wastes, their disposition and control, and not only the description of possible or supposed variants.

In text of WTS there are the results concerning only the neighbouring state – the Lithuanian Republic. But there are no quantitative data concerning the Latvian Republic, the borders of which are at a comparatively small distance - at the distance of 110Km from the Nuclear Power Plant. Latvia needs the information about the maximum supposed radiological contamination on the territory of Latvia in case of the accident on the above named APS, especially in case of unfavourable meteorological conditions.

In the text of “EIA” there is not enough information about observing such an important international requirement as the operative warning about a accident or an incident, about the readiness to react and the reliable work of the warning system.

It is not specified, what conditions are used for choosing three possible places liable for examining as variants for choosing an optimum ground for locating the APS.

There is insufficient experience of the operation be-
cause other reactors of the similar type are only in the stage of constructing.
There is insufficient analysis of the reason, why just this type of the reactor was chosen. It is probable, that the choice, to a great extent, was influenced by the experience of using the technologies of the Russian Federation, and also possible economic, not technical considerations.

<table>
<thead>
<tr>
<th>There is little information about the quantity of radioactive wastes and exhausts into the environment just from this type of the reactor</th>
<th>Section 7.4 Radiation effects,</th>
</tr>
</thead>
<tbody>
<tr>
<td>The analysis of the information is complicated because there is of ten no references on the sources of literature</td>
<td>Section 20 The list of related and normative documents and literature,</td>
</tr>
<tr>
<td>The reference at page 93 to the computer program MULTIBOX and the comparison of its results with other programs for analyzing the migration of radionuclides is not sufficiently grounded, because for the checking of the model and the system, the data about the temporary storages of the radioactive wastes, the initial information of which contains a large mistake, are used, - at the same time there is no ground to affirm that the system of supporting the given decision within the limits of the mistake is as reliable as many others, more tested.</td>
<td>Section 14.6.3 The forecast of possible radioactive pollution of ground waters,</td>
</tr>
<tr>
<td>There is no grounding for the scenario at page 94 – how the boundary conditions were chosen – 15m$^3$ and 600 ki of the liquid radioactive wastes, the influence of which is then analyzed, and the isotopic composition of the waste is not characteristic of the reactors of the type «PWR».</td>
<td>Section 14.6.3 The forecast of possible radioactive pollution of ground waters,</td>
</tr>
<tr>
<td>At page 96, the analysis of the epidemiology is made by means of using the data about the Belarusian people only, and the planned location of the Nuclear Power Plant is situated at 40 km only from Vilnius – therefore the analysis should be made for the population of the neighbouring countries.</td>
<td>Lithuania Republic did not present the data nessessary for making such assessment.</td>
</tr>
<tr>
<td>At page 110, there is no correspondence and the location of the object on the map.</td>
<td>So far as on page 110 there presented not a map but, and a graphic representation, requirements to scale observance are not applied to it.</td>
</tr>
</tbody>
</table>
2.7 Republic of Poland

1 Вставить ответ Польши о консультациях с 377-380
2 Вставить Ответ Польши на пересылку с.381

2.7.1 The responses on the remarks and proposals of the Ministry of the
Natural Resources and the Environmental Protection of the Republic of Poland

a) the detailed data of the doses of the ionizing radiation (indicating the data sources and their correspondence to the norms), and also the exact determination and description of DBA, i.e. the maximum designed and extra – design accidents.

The response: The design accident is a damage, the possibility of which is foreseen by the acting standard technical documentation of the given nuclear set and for which the technical project provides the radiation safety of the personnel and the population.

The maximum design accident (MDA) is the projected accident with the most serious consequences. All the modes of the designed damages may be divided into three groups:
– the accidents resulting in the outlet of the fission products into the containment;
– the accidents resulting in the flow from the first contour to the second;
– the accidents resulting in the bypass of the containment.

The most dangerous accidents of the first group, from the point of view of damaging the active zone, are the modes of “An instantaneous wedging of the main circulation pumping unit” and “The mode of large flow: the breakage of the turbo pipes of the first contour of the diameter of more than 100mm up to Dy 850”, in which dehermetization of 100% fuel elements in the active zone takes place. In the remaining accidents of the first group, no additional dehermetization of fuel elements takes place. Therefore the rest modes of the first group should have smaller radiational consequences. The only exception may be the accident with a small flow of heat carrier and the fault of the sprinkler system.

As an example of the maximum design accident, the mode of a large flow is considered: the breakage of the turbopipes of the first contour of the diameter 100 mm. Conservatively, it is accepted the admittance of 100% dehermetization. In the result of the break of the turbopipe of the first contour, the flow of the heat – carrier of the first contour takes place and, as a consequence, the increase of the pressure in the first containment.

Certain admissions were used in the calculations, which allowed to receive the scientifically grounded upper levels of the doses of radiation of the population in the result of the possible accident at the Belarusian Nuclear Power Plant:
– the exhaust of radionuclide into the environment because of the leakage through the loose nesses of the containment was calculated 24 hours before;
– the grounded exhaust was chosen because, in the case of the grounded exhaust, the higher levels of doses will be formed at a significant distance from the source of the exhaust.

The parameters of the models, used in the calculation, are given in the table P.29.

Table P.29 – The parameters of the model, used in the calculation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The operating power PWR – 1200 at the moment of accident.</td>
<td>3200 MWT (heat).</td>
</tr>
<tr>
<td>The state of the active zone.</td>
<td>100% exhaust of the volatile fission products</td>
</tr>
</tbody>
</table>

The end of Table P.29
The power of radionuclides exhaust from the active zone. 0.04% / hour (designed)

The mechanisms of the exhaust decrease. The irrigation is turned on, the filters do not act.

The exhaust height 0 m (grounded)

The vacant volume of the containment 71040 m$^3$

The surface square in the containment. 5325 m$^2$

For modeling the transfer of the radionuclides in the atmosphere, the worst scenarios of possible meteоconditions were chosen, i.e. the scenarios by which the doses of the radiation of the population will be maximum (the data of the prognostic fields of the meteorological parameters for the March 17, 2009, corresponding to the winter period), are given in the table P.30.

**Table P.30 – Meteorological conditions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The wind direction</td>
<td>Western, turning to south-west</td>
</tr>
<tr>
<td>The wind velocity</td>
<td>5.5 – 11 m/s</td>
</tr>
<tr>
<td>The pressure</td>
<td>1008,0 gPa</td>
</tr>
<tr>
<td>The air temperature</td>
<td>-2.5 - -1.5 in the night and in the morning, 3.7 – 1.8 in the daytime and in the evening</td>
</tr>
<tr>
<td>Cloudy</td>
<td>0%</td>
</tr>
<tr>
<td>The height of the mixture layer</td>
<td>1.2 – 1.5 km in the night</td>
</tr>
<tr>
<td>The category of the atmosphere stability</td>
<td>F</td>
</tr>
<tr>
<td>The precipitations intensity</td>
<td>From 1 to 4 mm/h</td>
</tr>
<tr>
<td>The snow cover</td>
<td>The snow cover height from 1 to 15cm</td>
</tr>
</tbody>
</table>

The quantitative and qualitative composition of the exhaust, used for the calculation, is given in the table P.31. The total activity of the exhaust – of the radionuclides into the environment at MDA for all the scenarios will make up $1.1 \times 10^{14}$ Bk.
Table P.31 – The exhaust of the radionucleids in the environment, Bk.

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Activity, Bk</th>
<th>Radionuclide</th>
<th>Activity, Bk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kr – 85</td>
<td>1,10 E + 11</td>
<td>Kr – 85m</td>
<td>4,40 E + 11</td>
</tr>
<tr>
<td>Kr – 88</td>
<td>1,30 E + 13</td>
<td>I – 131</td>
<td>4,70 E + 11</td>
</tr>
<tr>
<td>I – 132</td>
<td>6,70 E + 11</td>
<td>I – 133</td>
<td>9,50 E + 11</td>
</tr>
<tr>
<td>I – 153</td>
<td>8,30 E + 11</td>
<td>Xe – 131m</td>
<td>1,80 E + 11</td>
</tr>
<tr>
<td>Xe – 133m</td>
<td>1,10 E + 12</td>
<td>Xe – 135</td>
<td>6,10 E + 12</td>
</tr>
<tr>
<td>Cs – 134</td>
<td>4,20E + 10</td>
<td>Cs – 136</td>
<td>1,70 E + 10</td>
</tr>
<tr>
<td>Rb – 88</td>
<td>1,30 E +13</td>
<td>Ba – 137m</td>
<td>2,70E + 10</td>
</tr>
<tr>
<td>Kr – 87</td>
<td>8,90E + 12</td>
<td>Xe – 133</td>
<td>3,20E +13</td>
</tr>
<tr>
<td>Xe – 135m</td>
<td>1,30 E + 11</td>
<td>Xe – 138</td>
<td>3,20 E + 13</td>
</tr>
<tr>
<td>I - 134</td>
<td>1,00E +12</td>
<td>Cs - 137</td>
<td>2,70E +10</td>
</tr>
</tbody>
</table>

The results of the calculations of the “winter” scenario of the accident are given in the table P.32.

Table P.32 – The results of the prediction of the doses of the radiation of the population at MDA, MSV (mGy)

<table>
<thead>
<tr>
<th>Distance, km</th>
<th>Dose from a cloud, mSv</th>
<th>Dose from falling-out, mSv</th>
<th>Effective in halation zone mSv</th>
<th>Total effective dose, mSv</th>
<th>Dose of irradiating the thyroid gland, mGy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0,021</td>
<td>0,019</td>
<td>0,068</td>
<td>0,110</td>
<td>1,700</td>
</tr>
<tr>
<td>2.</td>
<td>0,015</td>
<td>0,011</td>
<td>0,040</td>
<td>0,066</td>
<td>1,000</td>
</tr>
<tr>
<td>5.</td>
<td>- **</td>
<td>-</td>
<td>0,019</td>
<td>0,030</td>
<td>0,480</td>
</tr>
<tr>
<td>25.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0,029</td>
</tr>
<tr>
<td>50.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0,022</td>
</tr>
</tbody>
</table>

* The dose of irradiating the thyroid gland includes only the dose of the radioactive iodine.
** All the values below 10 µSv were equaled to zero.

The results of modeling by means of the model Inter RAS have shown that:
- the total effective dose will exceed the criteria of interference in none of the given scenarios MDA (100 mSv on the whole body);
- to take counter-measures like the cover and/or evacuation of the population will not be necessary;
- the maximum calculated dose of irradiating the thyroid gland at MDA will not exceed the criteria of interference (50 mSv in the first seven days after the accident);
- the doses resulting from using the contaminated milk make up units or tenth parts of a millizivert.

An non-design basis accident (NDBA) is the accident caused by the unaccounted (in the projected accidents) initial events or followed by the additional (compared to the projected accidents) failures in the safety systems, the realization of erroneous decisions of the personnel that may lead to serious faults or to melting of the active zone.
As «NDBA», the accident was considered in the result of which the leakage takes place under the dry conditions. This scenario supposes the exhaust from the active zone of the reactor that is typical of the melting of the active zone. It is also supposed that the exhaust into the protective cover of the reactor takes place under the dry conditions through the system of the first contour, not passing through other systems which might settle the iodine or other evaporating fission products. The concentration of the iodine and / or other evaporating fission products in the protective cover of the reactor may be decreased before it passes to the atmosphere thanks to a few factors: the operation of the spray system, the filtration of the exhaust and (or the natural process of decay. This decrease is the function of the delay time. In this case the delay time is equal to zero, that is the leakage from the reactor started immediately. The systems of spraying and ventilating are disconnected. The exhaust is grounded, the effect of the influence of the buildings flow-around with the air fluxes is taken into account. The given conditions are chosen in order to consider the worst scenario «NDBA».

The parameters of the model are given in the table P.33.

Table P.33 – The parameters of the models used in the calculations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The operating power “PWR” -1200 at the moment of accident.</td>
<td>3200 MWt (heat)</td>
</tr>
<tr>
<td>The state of the active zone</td>
<td>10 – 50 % melting of active zone (quick exhaust of the evaporating fission products)</td>
</tr>
<tr>
<td>The power of the exhaust of radionucleids from the active zone</td>
<td>0,02% / hour</td>
</tr>
<tr>
<td>The mechanisms of the exhaust decrease</td>
<td>Irrigation disconnected, filters do not work.</td>
</tr>
<tr>
<td>The height of the exhaust</td>
<td>0 m (grounded)</td>
</tr>
<tr>
<td>The vacant volume of the containment</td>
<td>71040 m$^3$</td>
</tr>
<tr>
<td>The square of the surfaces of the containment</td>
<td>53250 m$^2$</td>
</tr>
</tbody>
</table>

The most serious extra – design accident, that was considered, is characterized by the following parameters:

Table P.34 – Meteorological conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The direction of the wind</td>
<td>Western, turning to south – west</td>
</tr>
<tr>
<td>The velocity of the wind</td>
<td>5,5 – 11 m/s</td>
</tr>
<tr>
<td>The pressure</td>
<td>1008,0 Pa</td>
</tr>
</tbody>
</table>

The end of Table P.34
The temperature of air -2.5 to -1.5°C, in the night and morning hours, 3.7 to 1.8°C in the daytime and in the evening.

Cloudiness 0%

The height of the layer of mixing 1.2 to 1.5 km at night, 0.5 to 0.3 km in the daytime and in the evening.

The category of the stability of the atmosphere F

The intensity of the precipitations From 1 to 4 mm/h

The snow cover The height of the snow cover is from 1 to 15 cm

Table P.34 – The exhaust of the radionuclides into the environment, Bk.

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Activity, Bk</th>
<th>Radionuclide</th>
<th>Activity, Bk</th>
<th>Radionuclide</th>
<th>Activity, Bk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kr – 85</td>
<td>1.00E + 13</td>
<td>Kr – 85</td>
<td>4.2E + 14</td>
<td>Kr – 87</td>
<td>8.4 E + 14</td>
</tr>
<tr>
<td>Kr – 88</td>
<td>1.2E + 15</td>
<td>Sr – 89</td>
<td>3.9E + 13</td>
<td>Sr – 90</td>
<td>1.5 E + 12</td>
</tr>
<tr>
<td>Sr - 91</td>
<td>4.60E + 13</td>
<td>Y - 91</td>
<td>3.30E + 12</td>
<td>Mo - 99</td>
<td>1.80E + 13</td>
</tr>
<tr>
<td>Tc – 99m</td>
<td>1.80E + 13</td>
<td>Ru – 103</td>
<td>1.20E + 13</td>
<td>Ru – 106</td>
<td>2.70E +12</td>
</tr>
<tr>
<td>Sb – 127</td>
<td>1.2E + 13</td>
<td>Sb – 129</td>
<td>6.9E + 13</td>
<td>Te – 129m</td>
<td>1.1E + 13</td>
</tr>
<tr>
<td>Te – 131m</td>
<td>2.5E +13</td>
<td>Te – 132</td>
<td>2.5E + 14</td>
<td>I – 131</td>
<td>4.1E + 14</td>
</tr>
<tr>
<td>I – 132</td>
<td>5.8E + 14</td>
<td>I – 133</td>
<td>8.3E + 14</td>
<td>I – 134</td>
<td>9.2E + 14</td>
</tr>
<tr>
<td>I – 135</td>
<td>7.3E + 14</td>
<td>Xe – 131m</td>
<td>1.7E + 13</td>
<td>Xe – 133</td>
<td>3.0E + 15</td>
</tr>
<tr>
<td>Xe – 133m</td>
<td>1.1E + 14</td>
<td>Xe – 135</td>
<td>5.8E + 14</td>
<td>Xe – 138</td>
<td>3.0E + 15</td>
</tr>
<tr>
<td>Cs – 134</td>
<td>2.6E + 13</td>
<td>Cs – 136</td>
<td>1.0E + 13</td>
<td>Cs – 137</td>
<td>1.70E +13</td>
</tr>
<tr>
<td>Ba – 140</td>
<td>8.8E + 13</td>
<td>La – 140</td>
<td>4.40E + 12</td>
<td>Ce – 144</td>
<td>1.2E + 13</td>
</tr>
<tr>
<td>Np – 239</td>
<td>2.3E + 14</td>
<td>Rb – 88</td>
<td>1.2E + 15</td>
<td>Rh – 106</td>
<td>2.7E + 12</td>
</tr>
<tr>
<td>Te – 129</td>
<td>1.10E + 13</td>
<td>Xr – 135m</td>
<td>1.2E + 14</td>
<td>Ba – 137m</td>
<td>1.70E + 13</td>
</tr>
<tr>
<td>Pr - 144</td>
<td>1.2E + 13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The total activity of the exhaust made up 1.50 x 10^{16} Bk for all the scenarios.

The doses of irradiation at this scenario of the accident are:

Table P.35 – The doses of irradiation at an early stage of the accident “NDBA” at different distances from the

[Table contents]

The total activity of the exhaust made up 1.50 x 10^{16} Bk for all the scenarios.

The doses of irradiation at this scenario of the accident are:
**Nuclear Power Plant**

<table>
<thead>
<tr>
<th>Distance, km</th>
<th>Dose from a cloud, m3b</th>
<th>Dose from falling – out, m3b</th>
<th>Effective inhalation dose, m3b</th>
<th>Total effective dose, m3b</th>
<th>Dose of irradiating the thyroid gland, mGy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.5</td>
<td>11.0</td>
<td>79.0</td>
<td>94.5</td>
<td>1500</td>
</tr>
<tr>
<td>2</td>
<td>2.4</td>
<td>6.3</td>
<td>47.0</td>
<td>55.7</td>
<td>910</td>
</tr>
<tr>
<td>5</td>
<td>1.1</td>
<td>2.9</td>
<td>22.0</td>
<td>26.0</td>
<td>420</td>
</tr>
<tr>
<td>25</td>
<td>0.14</td>
<td>0.18</td>
<td>1.3</td>
<td>1.62</td>
<td>25</td>
</tr>
<tr>
<td>50</td>
<td>0.11</td>
<td>0.13</td>
<td>1.00</td>
<td>1.24</td>
<td>19</td>
</tr>
</tbody>
</table>

* The dose of irradiating the thyroid gland includes only the dose of the radioactive iodine.

**Fig. P.15** – The total effective dose in the nearest zone of the Nuclear Power Plant, m3b
Fig. P.16 – The total effective dose in the far zone of the Nuclear Power Plant, mSv.

Fig. P.17 – The dose of irradiating the thyroid gland in the nearest zone of the Nuclear Power Plant, mSv (mGy).

Fig. P.18 – The dose of irradiating the thyroid gland in the nearest zone of the Nuclear Power Plant, mSv (mGy)
The analysis of the doses of irradiation has shown that the total effective dose will exceed the criteria of interference in none of the given scenarios «NDBA» (100 mSv for the whole body). The counter – measures like a cover, deactivation and/or evacuation of the population will not be necessary.

The maximum calculated dose of irradiation of the thyroid gland – at the criterion of interfere of 50 mSv during the first seven days after the accident at the distance of up to 25 km from the station, hence, in the radius of 25 km from the station the necessary counter – measure will be – to conduct the iodine preventive treatment at the initial stage of the accident.

The results of the modeling with the help of the international models convincingly demonstrate that:
– to organize the cover or the evacuation of the population will not be urgent;
– it is necessary to provide the effective blocking of the thyroid gland at the territory up to 25 km from the station;
– it is necessary to provide the limitation of the use of the food potentially contaminated with radionucleids – milk and others;
– it is necessary to provide the carrying out of the monitoring of the environment, food and forage at the distance of not less than 30 km from the station;
– to provide the monitoring of food at all the territory of the Republic of Belarus.

The dynamics of the development of a serious «NDBA» is given in the table P.36.

<table>
<thead>
<tr>
<th>Event</th>
<th>Time</th>
<th>Commentary</th>
</tr>
</thead>
<tbody>
<tr>
<td>The breakage of the turbopipe ДУ850 at the input of the reactor. The loss of all the sources of the alternating current.</td>
<td>0.0s</td>
<td>The initial event.</td>
</tr>
<tr>
<td>The disconnection of all the main circulation pumping units. The disconnection of the system of make – up and blowing.</td>
<td>0.0s</td>
<td>The superposition of the failure: the loss of all the sources of the alternating current of the Nuclear Power Plant, including all the diesel – generators.</td>
</tr>
<tr>
<td>The action of the emergency protection</td>
<td>1.9s</td>
<td>On the fact of the de-energizing of the unit with the delay of 1.9s.</td>
</tr>
<tr>
<td>The start of the operation of «ΓE – 1 CAO3».</td>
<td>8.0s</td>
<td>The decrease of pressure of the first contour below 5.9 «MDA».</td>
</tr>
<tr>
<td>The start of the system of the passive dissipation of heat.</td>
<td>30.0s</td>
<td>On the fact of the de – energizing at the section of the reliable supply with the delay of 30s.</td>
</tr>
<tr>
<td>The action of «ΓE – 2 CAO3»</td>
<td>120.0s</td>
<td>The lowering of the pressure of the first contour up to 1.5 «MDA» and the delay to twin the system «ΓE – 2».</td>
</tr>
<tr>
<td>Stopping the delivery of boron water from «ΓE –</td>
<td>144.0s</td>
<td>The lowering of the level in the tanks «ΓE – CΑΟ3»up</td>
</tr>
<tr>
<td>Event</td>
<td>Time</td>
<td>Commentary</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>«1САОЗ»</td>
<td>3600.03</td>
<td>The beginning of the condensation of vapour in the pipe still of the steam general. The parameters of the second contour are lower than the parameters of the first contour.</td>
</tr>
<tr>
<td>Stopping the delivery of boron water from «ГЕ – 2»</td>
<td>30.0h</td>
<td>The exhaustion of the reserve of the boron water.</td>
</tr>
<tr>
<td>The beginning of the generation of the hydrogen in the active zone by means of the oxidizing reaction.</td>
<td>44.6h</td>
<td>T fuel element &gt; 1000⁰K</td>
</tr>
<tr>
<td>The destruction of the active zone and the beginning of entering the destroyed materials of the active zone and internals into Booster station.</td>
<td>47.7h</td>
<td></td>
</tr>
<tr>
<td>The melting of the supporting lattice of Booster station and the getting of the parts of the active zone on the bottom of the reactor body.</td>
<td>51.0h</td>
<td>T of the supporting lattice &gt; 1500⁰K</td>
</tr>
<tr>
<td>The destruction of the body of the reactor and the beginning of the outlet of the melt to «УЛР».</td>
<td>52.0h</td>
<td>T of the body &gt; 1500⁰K</td>
</tr>
</tbody>
</table>

b) The determination of the method of the estimation of the maximum strength of the earthquake in the named localities.

Response: In the regions of the location of the competition grounds, the instrumental seismic observations were carried out. The background (standard) seismic city was determined in the regions of works. The seismic danger was estimated, and the seismic influences of the strong Karpathians earthquakes (the zone of Vranca) and the nearest zones of arising cells of the earthquakes («WHO») were calculated.

The degree of the seismic danger was estimated by the map of common seismic division into districts of the Northern Euroasia «ОСР – 97 – Д» of the scale 1: 10000000, where the territory of Belarus is also represented. The map corresponds to the repetition of the seismic effect average once in 100000 years (the average year risk is – 10⁻⁴) and the probability P = 0.5% of arising and the possible excess – during 50 years – of the seismic effect indicated on it in the points of the scale MSK – 64, and is designed for estimating the seismic danger of the regions of the location of the Nuclear Power Plants (NPP), the radioactive buries and other extremely important constructions.

c) The determination of the method of the estimation of the risk of the suffusion and carsting permitting to estimate the risk of activating above named phenomena in the Ostrovetsk locality.

Response: The estimation of the potential possibility of arising a suffusion – carsting process at the competition grounds was carried out on the basis of the analysis
of their geological structure, the prognosis of the change of the hydro geological conditions and the estimation of the technologenous flooding of the grounds.

d) A detailed information about the utilization of the radioactive wastes and the spent fuel, including the indication of the exact location of the storages of the fuel.

Response: The table P.37 presents the orienting information about the radioactive wastes liable to retreatment and storing at the Nuclear Power Plant.

Table P.37 – The quality of the wastes for the retreatment and further storage in the building of retreating low – active wastes from two units.

<table>
<thead>
<tr>
<th>The name of wastes</th>
<th>The place of forming</th>
<th>The quality of wastes from two units coming to the building 00UKS, m³/year (at standard operation, fuel wastes and repairs/at accidents)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The low – active fuel radioactive wastes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1. Fuels</td>
<td>Buildings of the zone of the controlled access</td>
<td>220 (110/110)</td>
<td></td>
</tr>
<tr>
<td>1.2. Non – burning pressed</td>
<td>Buildings of the zone of the controlled access</td>
<td>130 (65/65)</td>
<td></td>
</tr>
<tr>
<td>1.3. Metal</td>
<td>Buildings of the zone of the controlled access</td>
<td>20 (5/15)</td>
<td>50% for crushing</td>
</tr>
<tr>
<td>1.4. «TEN»</td>
<td>«PO»</td>
<td>1.0 (1/-)</td>
<td>50% for crushing</td>
</tr>
<tr>
<td>1.5. Filters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5.1. Non-burning pressed</td>
<td>Buildings of the zone of the controlled access</td>
<td>32</td>
<td>Once in two years</td>
</tr>
<tr>
<td>1.5.2. Fuels</td>
<td>Buildings of the zone of the controlled access</td>
<td>36</td>
<td>Once in two years</td>
</tr>
<tr>
<td>1.5.3. Hardened wastes</td>
<td>Building of the technological control systems of standard operation (SO) and special water purification (SWP)</td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td><strong>2. The average active fuel radioactive wastes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The name of wastes</td>
<td>The place of forming</td>
<td>The quality of wastes from two units coming to the building 00UKS, m³/year (at standard operation, fuel wastes and repairs/at accidents)</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>2.1. Metal</td>
<td>Buildings of the zone of the controlled access</td>
<td>10 (10/-)</td>
<td>90% for retreatment</td>
</tr>
<tr>
<td>2.2. Other wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.1. Fuels</td>
<td>Buildings of the zone of the controlled access</td>
<td>23 (11,5/11,5)</td>
<td>90% for retreatment</td>
</tr>
<tr>
<td>2.2.2. Non-burning pressed</td>
<td>Buildings of the zone of the controlled access</td>
<td>54 (54/-)</td>
<td>90% for retreatment</td>
</tr>
<tr>
<td>2.3. Filters</td>
<td>Building of the zone of the controlled access</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>2.3.1. Non – burning</td>
<td>Building of the zone of the controlled access</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>2.3.2. Fuels</td>
<td>Building of the zone of the controlled access</td>
<td>25,7</td>
<td></td>
</tr>
<tr>
<td>2.4. Hardened wastes</td>
<td>Building of the technological control systems of standard operation (SO) and special water purification (SWP)</td>
<td>16.8</td>
<td></td>
</tr>
<tr>
<td>2.5. Hardened wastes of waters of a special laundry and the set for burning</td>
<td>The building of retreatment and storing radioactive waste</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>3. Highly active fuel radioactive wastes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1. Intrareactor detectors</td>
<td>“PO”</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>3.2. Detecting units</td>
<td>“PO”</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

The final volume of the hard wastes (after the retreatment and not liable to retreatment) does not exceed 50m³/year from one unit.
The cells of the unit of storing the fuel radioactive wastes of the wastes building of the retreatment of the low-active wastes are designed for the organized storage of the low-, average- and highly – active fuel radioactive wastes, at present for the retreatment and the organized storage of the highly – active fuel radioactive wastes “An assembly of equipment for the organized storage of the hard radioactive wastes of the III group of activity” was envisaged to be developed of Atommashelexport, OJSC.

The low – and average – active fuel radioactive wastes are stored in the cells of the storage of hard radioactive wastes (“HRWS”) in the ferro – concreto non – resetting protective containers «Н3К – 150 – 1.5П».

Until now the radioactive wastes operated at the acting blocks, do not leave the area of the prom grounds of the Nuclear Power Plant, being located in the storages of the temporary storing of the hard radioactive wastes. When the «Н3К» is used as a packing, it supposed to store the radioactive wastes at the territory of the Nuclear Power Plant during 50 years. This decision “provides” both the regime order of the process of storing the radioactive wastes, and the decrease of the potential danger of the radioactive wastes (because of the decrease of the activity due to the natural decomposition).

The project envisages:

– the location for storing the fresh fuel which is built as the storehouse of the I class, that is the project excludes the possibility of water getting inside the storehouse of the fresh full;
– the basin for holding, where the storing (not less than tree years for decreasing the activity and the residual heat – evolutions) of the used fuel before its removal from the territory of the Nuclear Power Plant. The capacity of the basin for holding provides the storing of the used nuclear fuel («UNF») during ten years, including the locating of the defective fuel air mixture in the hermocotainers, and also the possibility of the unloading of all the active zone of the reactor in any moment of the operation of the Nuclear Power Plant.

The basin of holding has four sections: three sections for storing the used fuel and one section for loading the containers “TK – 13” for «UNF». The territory of the basin of holding is situated in the building of the “nuclear island”.

e) The detailed requirements for monitoring of radiological situation at the electric station indicating the methods of measurements, equipment and the number of measuring stations, the procedure and the system of rapid informing the adjoining countries in case of a accident.

The list of the controlled radionuclides in the environment is determined by the nomenclature of the radionuclides ejected by the local radiating objects in case of their standard operation (\(^{14}\)C, 3H, inert radioactive gases, 137, 134Cs, 60Co, 54Mn, 131I, 89,90Sr, 232Th, 238U, 226Ra, 210Po), by the list of the radionuclides forming technogenic (3H, 137, 134Cs, 90Sr, 239,240Pu, 232Th, 238U, 226Ra) and the natural (232Th, 238U, 226Ra, 40K, 220Rn) radiation background and the probable dose loads on the population in case of hypothetical accidents (131I, gamma – spectrum).

As a rule, to control the radiation situation, the following methods are used:
– method of gamma – spectroscopy analysis;
– the method of radio-chemical analysis;
– the method of dosimetric analysis.

The objects of the observation are over - land air, atmospheric fallings - out, snow, the components of ground ecosystems, the components of the forest ecosystems, the components of the agrarian ecosystems, the components of the water ecosystems, the surface waters and underground waters.

The gamma-spectroscopic analysis is the most informative method and it permits to determine the concentration of the majority of radionucleids of both natural and technogenic origin in a wide energetic range (50 – 2000 keV) with an error not more than 15-20 %. The measurements are carried out by the gamma – spectrometers of the type АДСАМ – 100, NOMAD, DAVIDSON (the firm ORTEC, USA) with the detectors of type GEM and GMX, made of especially pure germanium. The gamma – spectrometers passed the state check in the range of the registered radiation from 50 «keV» with the main respective error of determining the effectiveness for the confidential probability 0,95 of less than ± 10%. Carrying out the measurements and treatment of the results of measurements are conducted by means of the pack of programs GAMMAVISION – 32 and in accordance with the following methods and standards:

МИ 2143 – 91. The state system of providing the unity of measurements. The activity of the radionucleids in the volumetric samples. The methods of carrying out the measurements by the gamma – spectrometer.

Radiochemical determination of 90Sr is based on the conversion of the given radionucleid into the soluble state by the acidic treatment of the sample and refining from a number of radionucleids preventing from the determination of 90Sr. The determination of the contents of the radionucleid in the samples was carried out according to the following methods and standards,
– The methodical indications for determining the contents of strontium – 90 in the samples of soils. Approved by the Methodical section of the Interdepartmental commission on the radiation control of the environment of the «State Committee on Hydro-meteorology of the USSR, 17.03.89».
– «МВИ» of the concentration of the strontium by the flame – emission spectrometrical method. Approved by the Ministry of Natural Resources and Guarding the environment of the Republic of Belarus, 1995.
– The methodical indications for measuring radioactive compounds when conducting the radiochemical determinations of the content of the radionucleids in the samples of the environment. Approved by the Methodical section of the Interdepartmental commission on the radiation control of the environment of the «State Committee on Hydro-meteorology of the USSR, 17.03.89».

The table P.38 gives the list of the main devices and equipment used for determining the contents of the radionucleids.

<table>
<thead>
<tr>
<th>The name of the measuring device or the testing equipment</th>
<th>Type, manufacturer, enterprise (firm)</th>
<th>Main technical characteristic (range of measurements, error)</th>
</tr>
</thead>
</table>

Table P.38 – The devices and equipment used for determining the contents of the radionucleids.
<table>
<thead>
<tr>
<th>The name of the measuring device or the testing equipment</th>
<th>Type, manufacturer, enterprise (firm)</th>
<th>Main technical characteristic (range of measurements, error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomo – absorbing spectrophotometer.</td>
<td>AAS-3, Karl – Zeis “Jena” GDR.</td>
<td>Operating range: (190 ÷ 380), (38 ÷ 865) nm, sensitivity for Sr – 55mg/l, error – 10%.</td>
</tr>
</tbody>
</table>
| Alfa – beta – radiometer.                                | «УМФ-2000», «НПП» «Доза» Russia      | Beta – radiation: r – (0.1 ÷ 3000)Bk, sensitivity: (0.117 ÷0.161) imp/Bks, error – 15 %.  
Alfa – radiation: r – (0.01 ÷ 1000)Bk, sensitivity: 0.265 imp / (Bk’s), error – 15% |
| Beta - radiometer                                        | «РУБ – 01П1», Pyatigorsk atomic machine – building plant, Russia | Beta – range: 13 – 1300 Bk; sensitivity: 0.12 ± 0.002 c⁻¹ Bk⁻¹; error – 25% |
| Scales – laboratory, electronic                         | AR 2140, Firm OHAUS, Europe, Swede.  | Operating range: (0.01 ÷ 210) g, discreteness – 0.1mg. |
| Scales – laboratory, electronic                         | RV 1502, Firm OHAUS, Europe, Sweden. | Operating range: (0.5 ÷ 510) g, discreteness – 10mg. |
| Gamma - spectrometer                                     | ADCAM – 100/GEM 80205, ORTEC, USA    | Gamma – range: 40 – 3000 keV; error – 20 %. |
| Gamma - spectrometer                                     | EI – 1309 (МКГ – 1309), «ГИПП АТОМТЕСН», Belarus | The power of the ambient dose of the X – ray and gamma – radiation: range: (0.1 ÷ 10,0) mSv/h, error – 20 %.  
Density of beta – particles flux: range: (10÷10⁴) part / min x cm², error – 20 %. |
| Muffle stove                                             | «СНОЛ – 1.6, 2.5 1/11 АО» Утянос electrotechnique, Lithuania | Operating range: 10 – 1100 °C; error – 4 °C. |

The procedure and the system of rapid informing of the adjacent countries in case of the accident is worked out by the competent organization as a components part of the project of the Belorusian atomic power Plant and is not an object of “EIA”. It should be noted that this procedure should provide the carrying out of the carrying out of the obligations taken by the Republic of Belarus in the frame of the agreement – “The government of the Republic of Belarus, the government of the Republic of Poland on the 26th of October, 1994 “The agreement between the Government of the Republic of Belarus and the Government of the Republic of Poland about the operative informing about nuclear accidents and about the cooperation in the field of the radiation safety”.

f) Inserting into the text of the account of the concrete recommendations “MAEA” to which the authors refer in the section 2.6. “The criteria of the safety and the projected limits for NPP2006”.
The remark is accepted. In the text of the account about “EIA” of the Belorusian Nuclear Power Plant, there is a section 6.7.1. “The criteria of the safety and the projected limits”.

The tables P.39, P.40 show the projected limits of the effective dose of irradiation, the operational limits and the safety limits.

**Table P.39 – The projected limits of the effective dose of irradiation.**

<table>
<thead>
<tr>
<th>Name</th>
<th>Effective dose, mkSu/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>The population, the low limit at standard operation of the Nuclear Power Plant. The population, the upper limit. The population, the critical group at the border c33: - on the whole body; - on separate organs in the first year after the accident; Acceptance criteria in case of the projected accidents: - in case of accidents with probability of more than $10^{-4}$ event/year.</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>50000</td>
</tr>
<tr>
<td></td>
<td>$&lt;1$ mSv/event</td>
</tr>
<tr>
<td></td>
<td>$&lt; 5$ mSv/event</td>
</tr>
<tr>
<td>- in case of accidents with probability of less than $10^{-4}$ event/year</td>
<td></td>
</tr>
<tr>
<td>The population, in case of extra – projected accidents, the equivalent dose of irradiation of the critical group at the border «3П3М»: on the whole body, separate organs in the first year after the accident.</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>5000</td>
</tr>
<tr>
<td>The personnel (group A) during any successive 5 years, In a year</td>
<td>20000</td>
</tr>
<tr>
<td></td>
<td>$&lt;50000$</td>
</tr>
</tbody>
</table>
The personnel (group A) at the normal operation:
- average value of the collective effective dose for one energetic unit 1000MWt (el) at «ППР» and other works on the average during the whole projected period of operation
- average value of the collective effective dose for one energetic unit 1000MWt (el) at «ППР» and other works on the average during the whole projected period of operation

Special – purpose annual limit for the personnel on «БПУ» in case of the accidents considered in the project.

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table P.40 – The operational limits and the safety limits</td>
<td></td>
</tr>
<tr>
<td>The admissible quantity of «FUEL ELEMENT» with accidents of the type</td>
<td></td>
</tr>
<tr>
<td>“Gas looseness”</td>
<td></td>
</tr>
<tr>
<td>- the operational limit</td>
<td>0.02 % «FUEL ELEMENT»</td>
</tr>
<tr>
<td>- the safe operation limit</td>
<td>0/1 % «FUEL ELEMENT»</td>
</tr>
<tr>
<td>The temperature of the «FUEL ELEMENT» covers</td>
<td>&lt; 1200°C</td>
</tr>
<tr>
<td>The local depth of the oxidization of the «FUEL ELEMENT» covers</td>
<td>&lt; 18 %</td>
</tr>
<tr>
<td>The portion of the reacted zirconium in % of its mass in the «FUEL</td>
<td>&lt; 1 %</td>
</tr>
<tr>
<td>ELEMENT» covers</td>
<td></td>
</tr>
<tr>
<td>The number of the accidentd «FUEL ELEMENT» in the active zone for the</td>
<td></td>
</tr>
<tr>
<td>projected accidentd:</td>
<td></td>
</tr>
<tr>
<td>- with the probability of more than 10^-4 one/in a year;</td>
<td>&lt; 1 %</td>
</tr>
<tr>
<td>- with the probability of less than 10^-4 one/in a year.</td>
<td>&lt; 10 %</td>
</tr>
<tr>
<td>The calculated values of the summary probability of a serious extra –</td>
<td></td>
</tr>
<tr>
<td>projected</td>
<td>&lt; 10^-6</td>
</tr>
</tbody>
</table>
accident on all the initial events, 1/react year.

g) Specification: do the named data on the electric and heat power refer to the whole electric power station, i.e. to two energetic units or to each unit? Specification: do the designations NPP – 2006 and PWR – 1200 refer to the same model in the project of the reactor?

Response: The data on the electric and heat power refer to the whole electric power station, i.e. to two power units. The main technico-economic characteristics of the project of Nuclear Power Plant – 2006 (NPP – 2006) are given in the table 14 “EIA” of the Belorusian Nuclear Power Plant.

The project of the Nuclear Power Plant – 2006 is designed by two organizations:
– «ФГУП» «Атомэнергопроект», Moscow, on the bases of the project «NPP – 92» (Novovoronezhskaya Nuclear Power Plant);

Both projects use the reactor «PWR – 1200» (PWR – 1200).

h) Indicate, in what way the data about the blows – out and about the acting limits on the Russian electric power stations, given in the preliminary report (e.g. pages 67, 68, 108) refer to the situation in Belarus and its legislation.

Response: The Belarusian legislation in the field of the radiation protection of the population corresponds to the international legislation and the Russian legislation. In the account about “EIA” of the Belorusian Nuclear Power Plant the data from the “Annual account about the activity of the federal service on the ecological, technological and atomic supervision in 2005”, i.e. the real data of the Russian Nuclear Power Plants. They confirm the ecological safety of the Nuclear Power Plant in case of their operation in the standard mode and may be used in the materials of “EIA”.

2.7 Письмо GDOS-DOOS-082/2163/1355/09/JA z dnia 30 października 2009 r

1 Вpływ na obszar Polski w przypadku sytuacji awaryjnych.

W celu modelowania rozpowszechnienia się skażenia promieniotwórczego przy awarii pozaprojektowej / modelowanej awarii projektowej w zależności od warunków atmosferycznych wykorzystywano zautomatyzowany system analizy i prognozy sytuacji promieniotwórczej RECASS NT (FIAC Roshydromet (GU NPO „Tajfun”)). Obliczenie rozpowszechnienia się skażenia promieniotwórczego przy awarii pozaprojektowej / modelowanej awarii projektowej odbywało się z wykorzystaniem modelu o różnej skali przestrzennej. Są to modele:

- średniej skali – do 100 km (wykorzystywana do awarii pozaprojektowej)
- transgraniczny -- ~ 10³ km (wykorzystywany do modelowanej awarii projektowej)

Modele obliczają pola stężenia skażenia powierzchni podłoża w wyniku osadzania suchego / wilgotnego, zintegrowanego w czasie przyziemnego stężenia nuklidów
promieniotwórczych w konkretnych momentach czasu. Obliczenia kończą się wtedy, gdy obłok oddala się od źródła emisji na maksymalną przewidzianą dla modelu odległość lub kiedy zasoby aktywnej substancji promieniotwórczej spadną do 1x10^{-14} od poziomu pierwotnego. Z obliczeń wynika, że stężenie skażenia powyżej 37 k Bq/m^2 ogranicza się odległością 25-30 km od stacji. Prawidłowość podejścia i otrzymanych wyników modelowania potwierdzają pozytywna opinia Służby Federalnej Nadzoru Ekologicznego, Technologicznego i Atomowego z 12.11.2009 r. nr WB-46/578. Wpływ transgranicznego na tereny Polski w wyniku przeniesienia powietrznego skażenia promieniotwórczego nie przewidujemy.

- Modelowanie matematyczne w zakresie oceny możliwości nuklidowego skażenia promieniotwórczego odpływu wód i transgranicznego przeniesienia skażenia promieniotwórczego wykonano dla sytuacji najbardziej niekorzystnej – maksymalnego stężenia zanieczyszczeń nuklidami promieniotwórczymi na powierzchni wodnej ze wzięciem pod uwagę maksymalnego odpływu deszczowego z terytorium dorzecza zanieczyszczonego nuklidami promieniotwórczymi w wyniku awarii. Maksymalne stężenia prognozowane nuklidów promieniotwórczych (\(^{131}\)I, \(^{137}\)Cs, \(^{90}\)Sr) w nabieżniku transgranicznym w przypadku awarii pozaprojektowej nie przewyższają poziomów interwencji (PI) przewidzianych w Normach Bezpieczeństwa Promieniotwórczego (NBP-2000), według których PI dla \(^{90}\)Sr wynosi 5 k Bq/m^3, \(^{137}\)Cs – 10 k Bq/m^3, \(^{131}\)I – 6,3 k Bq/m^3.

2 Wpływ na system wodny oraz akwatorium w wyniku zrzucenia wód chłodzących

Strefa obliczeniowa praktycznie całkowitego mieszania się wód rzecznych i ścieków (80 %) wynosi przy zużyciu wody, bliskim do średnio-wiekoletniego – 18,4 km, przy minimalnym średniodobowym zużyciu dobowym 97% WP w warunkach mocnego obniżenia wodostanu została przedstawiona na rysunku P.19.
Rysunek P.19 – Zmiany stężenia maksymalnego substancji skażających w strefie mieszania się wód rzecznych i ściekowych Białoruskiej Elektrowni Jądrowej (stopień rozcieńczenia) na odcinku od zrzutu do nabieżnika kontrolnego Skażenie cieplne

Zgodnie z Aneksem nr 1 do Postanowienia Ministerstwa Zasobów Przyrodniczych i Ochrony Środowiska Republiki Białorusi i Ministerstwa Ochrony Zdrowia Republiki Białorusi z 8 maja 2007 roku nr 43/42 "O niektórych zagadnieniach normalizacji jakości wody obiektów wodnych gospodarstw hodowli rybnej" temperatura wody nie powinna być wyższa od naturalnej temperatury obiektu wodnego więcej niż o 5 °C z podwyższeniem ogólnym temperatury co najwyżej do 20 °C latem oraz 5 °C zimą dla obiektów wodnych, w których żyją gatunki ryb łososiowatych oraz siejowatych, i nie więcej niż do 28 °C latem i 8 °C zimą w pozostałych przypadkach.

Zgodnie z wymienionymi wymaganiami środowiskowymi wykonano obliczenia ewentualnego skażenia cieplnego rzeki Wilii poniżej zrzutu ścieków technicznych z uwzględnieniem wymaganego kryterium dotyczącego nieprzewyższenia temperatury wody w rzecie: latem nie więcej niż 28 °C; dla gatunków łososiowatych – nie więcej niż 20 °C; zimą – nie więcej niż 8 °C dla 2 bloków energetycznych w różnych warunkach hydrologicznych (przy średnio-wiełoletnich oraz minimalnych średniodobowych 97 % WP zużyciach wody). Obliczenia wykonywano przy maksymalnym odprowadzeniu ścieków technicznych z wykorzystaniem metody Frołowa-Rodzillera i rekomendacji Roshydrometu.

Wykonano obliczenia dla warunków letnich przyjęto maksymalną średniodobową temperaturę wody w okresie tarła, która wynosi 13,5 °C, przy obliczeniach dla warunków zimowych – minimalną temperaturę wody – 2,0 °C. W obliczeniach wzięto pod uwagę faktyczne morfometryczne i hydrologiczne charakterystyki rzeki, w tym jej pokrętność oraz dyspersję poprzeczną i podłużną. W wyniku obliczeń określono odległość do nabieżnika kontrolnego praktycznie zupełnego przemieszania się wód rzecznych i ścieków oraz podział temperatury wody w strefie mieszania się wód rzecznych i ścieków na wymienionym odcinku wody oraz oceniono strefy skażenia cieplnego.


<p>| Warunki hydrologiczne w rzecz Wilii poniżej ujęcia wody dla Białoruskiej Elektrowni Jądrowej | Zużycie wody, m³/s | Średnica rzeki, m | Średnia głębokość rzeki, m | Maksymalna głębokość rzeki, m | Średnia szybkość przepływu, m/s | Odległość do nabieżnika kontrolnego PK, km | Temperatura wody w nabieżniku kontrolnym (po całkowitym przemieszaniu) t-KC &lt;28° C zał, °C | Temperatura wody w nabieżniku kontrolnym (po całkowitym przemieszaniu) t-KC &lt;20° C dla łososiowatych, °C | Temperatura wody w nabieżniku kontrolnym (po całkowitym przemieszaniu) t-KC &lt;8° C zimą, °C |
|---|---|---|---|---|---|---|---|---|---|---|
| Przy średnio-wiełoletnim zużyciu wody | 65,78 | 65,17 | 1,75 | 2,57 | 0,58 | 29,5 | 24,07 | 0,45 | 14,0 | 0,60 | 2,8 |
| Przy minimalnym średniodobowym zużyciu wody 97 % WP w okresie letniego obniżenia wodostanu | 21,25 | 57,38 | 0,91 | 1,55 | 0,41 | 33,2 | 24,07 | 5,00 | 14,0 | 7,00 | 2,8 |</p>
<table>
<thead>
<tr>
<th>Przy minimalnym sredniodobowym zuzyciu wody 97% WP w ciągu zimowego obnizenia wodostanu</th>
<th>6,55</th>
<th>16,81</th>
<th>7,79</th>
<th>1,43</th>
<th>0,36</th>
<th>1,0</th>
<th>1,3</th>
<th>3,0</th>
</tr>
</thead>
</table>

Rysunek P.20 – Tryb temperaturowy rzeki Wilii w strefie pomieszania się wód rzecznych i ścieków technicznych Białoruskiej Elektrowni Jądrowej przy średniowieloletnich zużyciach wody w rzece i temperaturze ścieków technicznych 37°C przy ulokowaniu 2 bloków

odległość od miejsca zrzucania ścieków w dół po rzece, m

при сбросе в летних условиях
максимально допустимая температура воды для летнего периода
при сбросе в период нереста лососевых видов рыб
максимальная температура для водных объектов, где обитают лососевые и сиговые виды рыб
при сбросе в зимних условиях
максимально допустимая температура воды для зимних условий
Rysunek P.21 -- Tryb temperaturowy rzeki Wilii w strefie mieszania się wód rzecznych i ścieków Białoruskiej Elektrowni Jądrowej przy minimalnych średniodobowych zużyciach wody w rzece 97% WP (mocne obniżenie wodostanu) i temperaturze ścieków technicznych 37 °C przy ulokowaniu 2 bloków energetycznych.
Prognoza skażenia temperaturowego rzeki Wilii po zrzucie ścieków technicznych Białoruskiej Elektrowni Jądrowej o temperaturze 37 °C wykazała skażenie temperaturowe rzeki Wilii:
- na odcinku do 0,6 km w okresie wiosna - jesień i do 1,1 km w okresie zimowym przy zużyciu wody w rzece bliskim do średnio-wiekoletniego;
- na odcinku do 0,7 km w okresie wiosna - jesień i do 13 km w okresie zimowym przy minimalnym średniodobowym zużyciu wody w rzece 97 WP (w warunkach bardzo niskiego wodostanu).

W związku z istotnym skażeniem temperaturowym rzeki Wilii w wyniku zlewu ścieków technicznych Białoruskiej Elektrowni Jądrowej w celu zachowania warunków środowiskowych dla zrzucenia ścieków technicznych do rzeki Wilii zalecane są zbudowania inżynieryjne do ich chłodzenia w okresie letnim – do 25 °C, zimowym zaś – do 10 °C. W takim przypadku strefa prognozowa skażenia cieplnego ocenia się nie wyżej niż na 500 m (średnio 100-150 m), co jest zgodne z wymaganiami stawianymi do jakości wody obiektów wodnych gospodarstw hodowli rybnej poniżej odpływu.

Zgodnie z punktem 7 Instrukcji o trybie określenia normatywów dopuszczalnych ścieków substancji chemicznych oraz innych substancji do obiektów wodnych, zatwierdzonej Postanowieniem Ministerstwa Zasobów Przyrodniczych i Ochrony Środowiska Republiki Białorusi z 29.04.2008 r. nr 43 „przy zrzucaniu substancji skażających w składzie wód spływających do odpływów gospodarki rybnej normy jakości odpływu muszą być przestrzegane na całej długości obiektu wodnego lub jego odcinku, zaczynając od nabieżnika kontrolnego, położonego w odległości co najwyżej 500 metrów poniżej zrzutu wód ściekowych.

W ten sposób w materiałach „Ocena wpływu na środowisko Białoruskiej Elektrowni Jądrowej” udowodniono brak skażającego wpływu prognozowanego na środowisko Rzeczypospolitej Polskiej.

2.6.3 The account of remarks, received from the Republic of Poland during EIA procedure of Belorussian APS.

| Detailed information on ionising radiation doses (with instructions of sources of data and their conformity to norms), as well as exact definition and description of DBA, i.e. maximum of design and out-of design accident. | Section 14.5 Radiation exposure, |
| Identification of estimation method of an of the maximum force of earthquake on competitive sites of possible APS placing | It is not the subject of EIA (Addition II) Such information is contained in the design documentation which integrated part is IEIA. Works for APS site preceded developing of EIA. The characteristics of site received based on the results of such work are included in this report. |
| Identification of method on estimation of piping and karstification risk, allowing to estimate risk of activation of above listed phenomena for the Ostrovsksy platform | It is not the subject of EIA (Addition II) Such information is contained in the design documentation |
The detailed information on theme of recycling of radioactive waste and spent nuclear fuel, including instructions on exact site of fuel storage

The detailed requirements on monitoring of radiological environment on APS alone with instructions of a measurement procedure, the equipment and number of measuring stations, procedure and quick notification system of neighbouring countries in case of accident

Including in the report text of particular recommendations of IAEA to which were made reference by authors in section 2.6 “Criteria of safety and design limits for APS 2006”

Clarification, whether the mentioned in the document data on electric and thermal capacity concern power station in whole, i.e. two power units or every block; specification, whether designation NPP-2006 and PWR - 1200 in the reactor project concern the same model.

To specify, how the presented in the preliminary report (for example on p. 67, 68, 108) data on emissions and operating limits on the Russian power stations concern a situation of Belarus and its legislation.

Ze strony polskiej w spotkaniu uczestniczyli pracownicy Generalnej Dyrekcji Ochrony Środowiska, regionalnych dyrekcji ochrony środowiska w Białymstoku oraz Lublinie, przedstawiciele Państwowej Agencji Atomistyki oraz przedstawiciele wojewody podlaskiego oraz lubelskiego.


Strona białoruska przedstawiła w kolejnej prezentacji ocenę oddziaływania promieniowania jonizującego na mieszkańców Białorusi oraz krajów sąsiadujących w przypadku bezawaryjnego funkcjonowania elektrowni jak i przy wystąpieniu sytuacji awaryjnych. Przewidziane są dwa bloki energetyczne, każdy o mocy 1150 MWe. Czas eksploatacji wynosić będzie 50 lat. Przeprowadzone i zaprezentowane wyliczenia wskazują, iż przy normalnej eksploatacji elektrowni nie będzie ona stanowić żadnego ryzyka dla zdrowia i życia mieszkańców Białorusi oraz Polski. Roczna dawka napromieniowania mieszkańców terenów przygranicznych Polski przy granicy z Białorusią, przy normalnym funkcjonowaniu elektrowni, będzie wynosić 0,001 μSv. W przypadku wystąpienia awarii ponadprojektowej (rdzeń ulega stopieniu w 10-50%) skuteczna dawka promieniowania w odległości 100 km wynosić będzie 0,438 mSv.

Dwie kolejne prezentacje dotyczyły kwestii oddziaływania radiacyjnego planowanej elektrowni na rolnictwo i przedstawiały szczegółowo etap planowania i prowadzone badania projektowej inwestycji.
W kolejnej części spotkania strona białoruska ustosunkowała się do pytań zgłoszonych przez stronę polską. Pytania te obejmowały następujące kwestie:

1. Przedstawienie danych na temat zagrożenia zanieczyszczenia wód powierzchniowych i podziemnych związanego z funkcjonowaniem elektrowni, w szczególności ze składowaniem odpadów.

2. Opisanie skutków w przypadku wystąpienia poważnej awarii przemysłowej oraz propozycje działań profilaktycznych zabezpieczających u źródła przed poważną awarią wraz z oceną stopnia ich skuteczności.

3. Przedstawienie możliwości przeniesienia skażenia radioaktywnego (chmura radioaktywna i opadanie pyłu) będącego skutkiem awarii (forma graficzna modelująca zasięg oddziaływania elektrowni jądrowej), w zależności od warunków atmosferycznych.

4. Przedstawienie propozycji informowania odpowiednich organów strony polskiej o aktualnej sytuacji radiologicznej w ramach monitoringu radiologiczno-ekologicznego na etapie eksploatacji i likwidacji elektrowni jądrowej.

5. Przedstawienie procedury oraz systemu wczesnego powiadamiania strony polskiej w przypadku wystąpienia sytuacji awaryjnych, przedstawienie planów postępowania awaryjnego oraz określenie współpracy w tym zakresie z odpowiednimi organami w Polsce.

6. Przedstawienie informacji na temat ilości odpadów radioaktywnych i technologii ich zagospodarowania.

7. Określeniem warunków bezpieczeństwa w procesie wstępnego składowania odpadów radioaktywnych na terenie elektrowni atomowej.

8. Przedstawienie bliższych informacji na temat transportu odpadów radioaktywnych i stosowanych środków bezpieczeństwa w trakcie transportu do miejsc ich przetwarzania.

9. Przedstawienie informacji o lokalizacji docelowego składowiska odpadów radioaktywnych.

10. Wykonanie i udostępnienie wyników analizy porealizacyjnej

Strona białoruska zauważyła, że część odpowiedzi już została przedstawiona w trakcie prezentacji. Ponadto przy wykonywaniu końcowej dokumentacji oceny oddziaływania na środowisko zostanie zawarte szereg wyjaśnień.

Ad. 1 Strona białoruska przedstawiła prezentację, w której zawarto wyniki emisji dla elektrowni jądrowej na przykładzie funkcjonującej elektrowni na Ukrainie. Elektrownia ta pracuje w oparciu o reaktor WWER 1000 (reaktor II generacji). Przedstawiono dane na temat zawartości trytu (H$^3$) i strontu (Sr-90) w wodzie na przykładzie rzeki Bug. Przyjęta przez Białoruś norma wynosi dla H$^3$ 7,7 $\times 10^3$ Bk/kg, a dla Sr 5 Bk/l. (Proszę o uzupełnienie)

Ad. 2 Nie wszystkie dane są dostępne dla ogółu społeczeństwa, ale wszystkie warianty były analizowane pod względem możliwości wystąpienia wszystkich potencjalnych awarii technicznych. Ich wyniki było stwierdzenie, że żadne zagrożenia zewnętrzne nie będzie miało wpływu na eksploatację elektrowni. (Proszę o uzupełnienie)

Ad. 3 Badania na ten temat zostały przeprowadzone przez naukowców rosyjskich, jest to program standaryzowany i w dokumentacji przedstawiono wyniki uzyskane z tego programu.

Ad. 4 Ze względu na to, że Białoruś sąsiaduje z krajami, w których funkcjonują elektrownie jądrowe, otrzymuje wyniki pomiarów promieniowania radioaktywnego w
sposób ciąży przez całą dobę z częstotliwością 10 minutową, prowadzone są też badania stanu zdrowia ludności. Jeżeli dojdzie do budowy elektrowni to Białoruś jest zobowiązana do prowadzenia stałych pomiarów i będzie przesyłać Polsce wszelkie informacje z monitoringu wpływu na zdrowie ludzi i na środowisko naturalne. W związku z tym, iż zarówno strona białoruska jak i strona polska jest członkiem IAEA - Międzynarodowej Agencji Energii Atomowej (MAEA), dlatego między tymi państwami na szczeblu międzynarodowym uregulowane zostały wszelkie kwestie dotyczące bezpieczeństwa jądrowego.

Ad. 5 Według strony białoruskiej Polska podpisała i ratyfikowała konwencję międzynarodową, której zapisy obowiązują do informowania o awarii jądrowej oraz konwencję dotyczącą pomocy w sytuacji awarii, dlatego też w ramach tych umów postulaty strony polskiej będą realizowane. Również mamy dwustronną umowę pomiędzy Polską a Ukrainą (umowa o wczesnym powiadomianiu o awariach jądrowych i o współpracy w dziedzinie bezpieczeństwa radiologicznego z 1994 r) i w ramach tych wszystkich umów, będzie ta współpraca prowadzona.

Ad. 6 Strona białoruska zaznaczyła, że należy spryczować jakich odpadów dotyczy pytanie. Jeżeli chodzi o odpady technologiczne to kwestia została szczegółowo wyjaśniona w dokumentacji. Dla jednego bloku przewiduje się wyprodukowanie 50m³ odpadów stałych. W ich składzie znajduje się ok. 73% słabo aktywnych odpadów, 26% średnio aktywnych odpadów i 1% wysoko aktywnych odpadów. Technologia przewiduje przechowywanie wysokoaktywnych odpadów najpierw w zbiorniku wodnym dla zużytego paliwa na terenie elektrowni, a odpady średnio i niskoaktywne na specjalnym składowisku znajdującym się na terenie elektrowni o pojemności wystarczającej na składowanie odpadów przez 50 lat eksploatacji elektrowni.

Ad. 7 To jest kwestia zrozumiała i oczywista.

Ad. 8 Strona białoruska zaznaczyła, że pytanie należy doprecyzować i wyjaśnić o jakich dokładnie odpadach jest mowa, czy chodzi o zużyte paliwo, czy też o odpady technologiczne. W obu przypadkach obowiązują różne procedury. Wypalone paliwo to materiał jądrowy i transportowane jest w kontenerach drogą kolejową. Żadnych sytuacji awaryjnych związanych z transportem odpadów wg wiedzy prezentującego nie było. Odpady technologiczne są produkowane w każdym kraju i na Białorusi produkuje się ich ok. 11m³ rocznie. Składowane są na odpowiednim składowisku. Opracowany jest system ich transportu drogą kolejową.

Ad. 9 Powstające płynne odpady radioaktywne ulegają przetworzeniu do postaci stałej będącej końcowym produktem. (Proszę o uzupełnienie)

Ad. 10 Strona białoruska zaznaczyła, iż obecnie tryb pracy reaktorów jądrowych jest na bieżąco prezentowany i dostępny w internecie w bazie MAEA.

Jako uzupełnienie pytań dotyczących systemu zabezpieczeń przed awarią główny inżynier elektrowni przedstawił następujące informacje: Bardzo szczegółowo jest opisane postępowanie załadunku paliwa do rdzenia reaktora. Na to potrzebne jest pozwolenie właściwego organu nadzoru. Informacja o próbnej eksploatacji też jest przekazywana odpowiednim jednostkom i w przypadku jakichkolwiek wad konstrukcyjnych eksploatacja jest wstrzymywana. Pierwsza faza rozruchu polega na sprawdzeniu pracy urządzeń i systemów zabezpieczeń elektrowni jądrowej bez użycia paliwa jądrowego. To zaleta reaktorów wodno-cisnieniowych.

Po szczegółowych wyjaśnieniach dotyczących tego pytania – strona polska wyjaśniła, że ocena porealizacyjna ma na celu porównanie charakteru i wielkości prognozowanych oddziaływań na ludzi i elementy środowiska zidentyfikowanych i opisanych w raporcie
OOS z oddziaływaniem, które pojawiły się w rzeczywistości, po realizacji konkretnego przedsięwzięcia. Konwencja z Espoo w art. 7 przewiduje wymianę dokumentów dotyczących tej kwestii. Ponadto, stronie polskiej zależy na udostępnieniu zmian przepisów prawnych związanych z monitoringu ochrony środowiska, które zachodziłyby na Białorusi w trakcie czasu prowadzenia monitoringu środowiska związanego z działalnością elektrowni jądrowej.

Strona białoruska wyjaśniła, że jest krajowy system monitoringu związany z tym, że w krajach sąsiednich są elektrownie jądrowe. Jest to zautomatyzowany system monitoringu skażenia radiologicznego. Aktualnie prowadzone są pomiary stanu zanieczyszczenia co 10 minut. Białoruś ma z tymi krajami umowę o wymianie tych danych. Jeżeli dojdzie do budowy, pomiary będą wykonywane przez cały okres eksploatacji elektrowni i Białoruś jest zdecydowana przesyłać Polsce wszelkie informacje z monitoringu środowiska.

Strona polska poinformowała, że interesuje ją w szczególności skuteczność zabezpieczeń elektrowni przedstawionych w dokumentacji, a właśnie ocena porealizacyjna pozwoli ją wykazać. Strona polska chciałaby otrzymać wyniki tej oceny porealizacyjnej.

Dodatkowe pytania i wyjaśnienia

Strona polska poprosiła o przekazanie informacji o planach postępowania w razie sytuacji awaryjnej, ponieważ w Polsce kwestia ta jest prawnie uregulowana stosownym rozporządzeniem rady ministrów.

Na Białorusi istnieje ustawa o bezpieczeństwie jądrowym i ochronie radiologicznej, w trybie której każdy obiekt, pracujący z materiałami promieniotwórczymi (np. szpital) nie uzyska zezwolenia na ich wykorzystywanie dopóki nie przedstawi dokumentacji z planem postępowania w sytuacjach awaryjnych. W zeszłym roku w związku z wymaganiami IAEA (MAEA) Białoruś musiała dostosować prawo w tej kwestii i obecnie żaden właściciel elektrowni nie uzyska pozwolenia dopóki nie przedstawi planów awaryjnych, a co za tym idzie również dotyczących działań podjętych na zewnątrz elektrowni. Jeżeli Prezydent zatwierdzi i podpisze projekt dla obszaru ostrowieckiego, natychmiast zostanie sporządzona stosowna dokumentacja. Strona białoruska podała informację na temat inicjatywy wiedeńskiej, której projekt obecnie jest opracowywany i dzięki któremu pomiędzy państwami będącymi członkami tej grupy wiedeńskiej ustalona zostanie stała wymiana informacji na temat promieniowania radioaktywnego. Strona białoruska ma nadzieję, że zostanie on wdrożony przed rozpoczęciem realizacji inwestycji.

W trakcie spotkania przedstawiciele Państwowej Agencji Atomistyki w Polsce poprosili o dokładniejsze dane na temat składu rdzenia atomowego (tzw. core inventory), aby móc na tej podstawie przeprowadzić analizę na temat przewidywanej emisji produktów rozszczepienia opartą o dane rzeczywiste, a nie ekstrapolowane.

Wszystkie przedstawione w dokumentacji oceny oddziaływania na środowisko wyliczenia zostały przeprowadzone dla reaktora o mocy 1000MWe i uważa się, że będą one z niewielką różnicą odpowiadały wyliczeniom dla planowanego projektu. Wszelkie dane, również na temat składu rdzenia zostaną przekazane Polsce po podpisaniu kontraktu ze stroną rosyjską, która jest dostawcą tego reaktora. Obecne wyliczenia strony białoruskiej mają charakter szacunkowy.

Czy technologia rosyjska jest tą technologią, która zostanie ostatecznie wybrana?

Ostateczne składowanie wypalonym paliwa?

Kontrakt na budowę elektrowni będzie również obejmował kontrakt z Rosją na transport wypalonymi paliwami do zakładu rosyjskiego zajmującego się jego przetwarzaniem. Zgodnie z przyjętym schematem, odpady powstałe w wyniku przetwarzania wypalonym paliwem jądrowym powrócą do Białorusi i nastąpi ich składowanie w planowanym składowisku wysokoaktywnych odpadów promieniotwórczych. Krajowa Akademia Nauk opracowuje obecnie strategię postępowania z wypalonym paliwem oraz z odpadami powstałymi w wyniku jego przetwarzania.

Czy przeprowadzona została analiza jakichkolwiek ośrodków skalnych, mogących stanowić składowisko wysokoaktywnych odpadów za kilkadziesiąt lat? Czy opracowane zostały regulacje prawne zabezpieczające fundusze na budowę składowiska w przyszłości?

Strona białoruska zadeklarowała, iż w chwili obecnej przy szacowaniu całej inwestycji przewidziane są również środki na składowanie wysokoaktywnych odpadów. Jeżeli chodzi o miejsce składowania odpadów to planowane są prace mające na celu określenie najbardziej bezpiecznego miejsca.

Czy analizując budowę geologiczną podłoża, uwzględniono przewidywane trzęsienia ziemi? Jakie scenariusze były rozważane np. uskoki czy płytkie trzęsienia ziemi? Czy występuje zjawisko krasowienia w tym obszarze?

Strona białoruska przewiduje dla całego planowanego projektu w rejonie ostrowieckim wytrzymałość konstrukcji dla wstrząśwaj 8 w skali MSK, a biorąc pod uwagę nizinny charakter Białorusi oraz dotychczasową częstotliwość zjawisk sejsmicznych stanowi to duży margines bezpieczeństwa. W wyliczeniach wykorzystano dane historyczne na temat trzęsień ziemi na terenie Białorusi, terenów sąsiadujących oraz Karpat. Przeprowadzono badania sejsmologiczne na całym tym terenie i na wszystkich obszarach wariantowych monitorowana jest ciągła sytuacja sejsmologiczna. Jeżeli chodzi o zjawisko krasowienia to po przeprowadzonych konsultacjach ze specjalistami, stwierdzono że zjawisko to może występować w 2 pozostałych lokalizacjach, ale mimo tego nie stwierdzono na tej podstawie przeciwwskazań do lokalizacji ektrowni jądrowej. Dla obszaru ostrowieckiego nie przewiduje się wystąpienia zjawiska krasowienia, dlatego aby mieć całkowitą pewność w tej kwestii wybrano rejon ostrowiecki.

Czy planowany jest monitoring osiadania konstrukcji?

Jest on obowiązkowo przewidziany w projekcie.

Pytanie dotyczące zanieczyszczeń emitowanych przez tą instalację. Czy ustalono normy dotyczące badanych parametrów.
Na przykładzie elektrowni rosyjskich, zgodnie z konstrukcją elektrownia będzie wykorzystywała 2,5 % wody z rzeki, natomiast jej zrzut planowo będzie stanowił 1%. Nie przewiduje się zanieczyszczenia wody metalami ciężkimi. Zgodnie z państwowym monitoringiem przewiduje się badanie ok. 50 parametrów, a informacje oraz wyniki na ten temat zostały szczegółowo przedstawione w dokumentacji.

Jaka decyzja będzie kończyła postępowanie?

Po otrzymaniu końcowego sprawozdania z przeprowadzonych konsultacji wszelkie uwagi zostaną przeanalizowane. Dokumentacja końcowa (raport końcowy) oceny oddziaływania na środowisko zostanie uzupełniona o wyjaśnienia na pytania otrzymane od strony polskiej i innych państw zainteresowanych udziałem w postępowaniu transgranicznym. Wydana zostanie decyzja określana mianem ekspertyzy ekologicznej dla ostatecznie wybranego wariantu. Zgodnie z art. 6 Konwencji z Espoo, po podjęciu decyzji i po przeprowadzeniu oceny oddziaływania na środowisko planowanej inwestycji, zostanie ona przekazana Polsce.

Czy dokumentacja- raport dotyczący analizy przeprowadzonej przez IAEA jest dostępny dla innych państw?

Strona białoruska uważa, że nie ma potrzeby, aby ten dokument był w składzie przedstawionej Polsce dokumentacji oceny oddziaływania na środowisko. Zadeklarowano jednak, iż jeżeli strona polska jest zainteresowana dostępem do szerszych informacji na ten temat, musi ona złożyć wniosek w tej sprawie do IAEA, a Białoruś przeprowadzi wszelkie niezbędne kroki, aby to umożliwić.

Postanowienia końcowe

Sporządzony protokół z konsultacji przez stronę polską zostanie przesłany stronie białoruskiej do 20.06.2010 roku i uzupełniony przez stronę białoruską, a następnie podpisywany przez obie strony. Strona polska zwróciła się do strony białoruskiej o przekazanie informacji uzupełniających w stosunku do zapytań strony polskiej, które nie zostały jeszcze w sposób wyczerpujący przedstawione oraz przekazanie dokumentów, które strona białoruska w trakcie prowadzonych rozmów deklarowała się udostępnić. Informacje te dotyczą następujących kwestii:

1. Udostępnienie danych projektowych dotyczących reaktora po podpisaniu stosownego kontraktu z jego dostawcą, w szczególności zawierających informacje o rodzaju i ilości substancji promieniotwórczych w rdzeniu reaktora (tzw. core inventory)
2. Udostępnienie zewnętrznych planów awaryjnych dla elektrowni jądrowej
3. Udostępnienie długoterminowej strategii dotyczącej postępowania z odpadami promieniotwórczymi i z wypalonym paliwem jądrowym
4. Przekazywanie danych z monitoringu stanu środowiska w tym monitoringu radiacyjnego, dopóki nie zostaną podpisane stosowne umowy międzynarodowe
5. Postulat o zawarciu w decyzji zezwalającej na realizację inwestycji zapisu o konieczności przeprowadzenia analizy porealizacyjnej, określenia jej terminu i zakresu. Strona polska prosi o udostępnienie wyników tej analizy. Ponadto, prosi o przedstawienie informacji o ewentualnych odstępstwach od projektu przewidzanego w dokumentacji oceny oddziaływania na środowisko.

Strona białoruska poinformowała, iż nie widzi przeciwwskazań, aby wyniki takiej analizy udostępnić. Strona białoruska zaakceptowała również powyższe postulaty
2.8 RESPONSES TO THE REMARKS AND PROPOSALS OF THE GROUP OF PUBLIC ORGANIZATIONS

On September 21, 2009 the critical remarks to “Statement of Possible Influence on Environment of the Belarusian Nuclear Power Plant (the Preliminary Report on EIA of the Belarusian Nuclear Power Plant ) have been received from the group of the public organizations: the Belarusian Green Party, Ecoprotection Group, «Scientists for Denuclearized Belarus» Movement, «Ecodom» Public Organization to the address of the State bodies, Minskenergo, DSAE State Enterprise, BelNIPIENERGOPROM Republican State Enterprise.

Question 1. EMISSIONS AT OUT-OF-DESIGN ACCIDENTS

The estimation of emissions of radioactive substances at the so-called «out-of-design accidents» is underestimated by at least 10 times in comparison with the world practice of estimation of influence of the Nuclear Power Plant on environment and more than by 320 times in comparison with emissions of the accident of the similar reactor which have already taken place.

RESPONSE: Out-of-design accident – is the accident caused by the initial events not being taken into consideration or being accompanied with additional failures of the systems of safety over individual failure as compared with design accidents, execution of erroneous actions of the personnel.

The emergency events including considerable degradation of an active zone are being called serious accidents (SA). According to the requirements of the International Atomic Energy Agency and the General Rules of Safety 88/97 valid in the Russian Federation for the projects of increased safety (Nuclear Power Plant -2006) the acceptance criteria on the basis of the probable analysis of safety are as follows:

- The total probability of a serious out-of-design accident does not exceed $10^{-5}$ for a reactor per year;
- The maximum accident emission has been determined for residual risk of $10^{-7}$ for a reactor per year.

In case of a serious accident the most part of fuel in a reactor is damaged. At violation of integrity of the case of a reactor fission products can penetrate to the space of containment. The following factors prevent to further discharge of fission products to environment:

- A double protective cover;
- A melt trap.

The limit of emission as a result of serious accident should not cause sharp influences on health of the population close to the Nuclear Power Plant, at that long-term restrictions on use of extensive territories of land or water should not be introduced. The
example of the given statement is the accident at Three Mile Island Nuclear Power Plant with a reactor of the first generation in the course of which despite of serious damage of the active zone (50% of AZ) the case of a reactor bearing pressure, and containment have prevented emission and remained intact. Influence on environment was small enough.

The modern projects of the Nuclear Power Plants with reactor plants of generation 3+, including the Nuclear Power Plant-2006 project (which is based on the projects of the Nuclear Power Plant-92 and the Nuclear Power Plant-91/99) correspond to the requirements of the European Power Companies to the Nuclear Power Plant with light-water reactors (EUR). In Volume 2 of «the General Requirements to the Nuclear Equipment of the Nuclear Power Plant», Chapter 1 of "Safety Requirement", the Appendix B of «the Process of Verification of Targets of EUR Regarding Influence on Environment» the criteria of the limited influence for out-of-design conditions with residual risk of $10^{-7}$ for a reactor per year are registered.

(1) absence of Urgent Protective Actions (evacuation) at a distance of more than 800 m;
(2) absence of the Delayed Actions at a distance of more than 3 km;
(3) absence of Long-term Actions at a distance of more than 800 m;
(4) the limited economic influence.

At modelling of the consequences of emergency emission at out-of-design accidents in the working papers of EIA the following scenarios (Table P.41) have been considered:

Table P.41 - Emission of radionuclides

<table>
<thead>
<tr>
<th>Considered scenarios</th>
<th>Emission of radionuclides, Bq</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>iodine -131</td>
</tr>
<tr>
<td>Cold period</td>
<td>4,0 Е+14 (molecules)</td>
</tr>
<tr>
<td>Warm period: scenario I</td>
<td>1,0 Е+14</td>
</tr>
<tr>
<td></td>
<td>3,1 Е+15</td>
</tr>
</tbody>
</table>

The given values of emergency emission have been used for calculation of density of pollution of territory and estimation of influence on agriculture, surface and underground waters. As is well seen from the Table, the values of activity of cesium-137 by 3,5 times more than the value of 1,0 Е+14 Bq mentioned by the authors of «Critical Remarks » have been used.

For calculation of radiation doses for the population the most probable emissions of radionuclides for reactors of water-moderated water cooled power reactors type of generation 3+ have been used: total 1,5 Е+16 Bq, iodine 131 = 4,1 Е+14 and cesium-137 = 1,7Е+13. Taking into account a probable fission yield from containment 0,2% we will receive the following values:

- Iodine-131: 4,1 Е+14: 0,0025 = 1,6 Е+17 Bq (Chernobyl accident iodine 131 = 2,7 Е+17 Bq)
- Cesium 137: 1,7 Е+13:0,0025 = 6,8 Е+15 Bq (Chernobyl accident Cesium 137 = 3,7Е+16 Bq).
Thus, taking into account the integrity of the physical protective barriers, the values of emissions being used for calculations of radionuclides are being well coordinated with escape of the Chernobyl Nuclear Power Plant.

The information for the authors of Critical Remarks: For the considered class of serious accidents with probability of escape at a level of $10^{-7}$ 1/year according to НП-032-01 as a result of estimation and analysis of the predicted levels of emission of surfactant species has been offered radiation-significant nuclides:

- For the early phase of the accident connected with leaks of the fission products through leakages of double containment and bypass of containment, ground emission: xenon-133 - $10^4$ TBq; iodine-131 - 50 TBq; Cesium-137 - 5 TBq;
- For intermediate and late phases of the accident at pressure decrease in containment connected with emissions through a ventilating pipe: xenon-133 - $10^5$ TBq; iodine-131 - 50 TBq; Cesium-137-5Tbq.

Distinction in the values of the surfactant species defines in this case not the type of the reactor plant but safety systems (protective, localizing, providing for)

Decision 395/1991 of the Government of Finland does not establish the scenario, but gives restriction on the levels of radiation influence «A threshold of activity release into the atmosphere is defined as 100 TBq of Cs-137 and that no acute health effects shall occur among the surrounding population. The combined fall-out consisting of nuclides other than cesium isotopes shall not cause in the long term, strating three months from the accident, a hazard greater than would arise from a cesium release corresponding to the above mentioned limit.

Question 2. EMISSIONS AT THE MAXIMUM DESIGN ACCIDENT

Emissions at the maximum design accident are underestimated at least by four thousand times.

Design-basis accident (DBA) are the emergencies on which the plant has been developed according to the established design criteria, and for which damage of fuel and emissions of radioactive materials will be limited within the established limits. In case of DBA the safety systems and containment of the Nuclear Power Plant will limit the quantity of emissions of radioactive materials in environment to such a level at which pollution of the ground surface and foodstuffs will be below the limits established by the TSLA. The maximum radiation dose for the population in case of design-basis accident should not exceed 10 mSv. The examples of the typical design-basis accidents - loss of control over reactivity, accidents at handling of fuel, accident with coolant loss (LOCA), etc. The given condition should be executed also at maximum design-basis accidents (MDBA). As per the International scale of nuclear events this is level 4 – the accident without a great risk outside the site. In EIA of the Lithuanian Nuclear Power Plant to which the authors of «Critical Remarks …» refer two Tables of emissions of radionuclides in environment have been stated.

Table 10.3-1 "Activity of Emissions to Environment during LOCA, Depending on Time in Bq, INES Level 5", p.524. The total emission of radionuclides is equal to 8,36 E+16 Bq. (USA-APWR DCD, 2007)
Table 10.3-2 "Emissions to Environment in Case of Serious Accident (Bq), INES Level 6», p.526. The total emission of radionuclides is equal to 6,43E+15 Bq.

The authors of the «Critical Remarks …» make comparison of MDBA in EIA of the Belarusian Nuclear Power Plant and the accident of Three Mile Island. We shall illustrate incorrectness of comparison by the following example.

In Table P.42 the data of Table 10.3-1 of EIA of the Lithuanian Nuclear Power Plant have been cited. From the Table it follows that the total emission amounts to 8,36 E+16 Bq, and total activity of iodine-131 in emission is 3,49E+14 Bq, of Cesium - 137 is equal to 3,06E+12 Bq which is equal to 0,4 % of the total emission. Thus, as a result of incorrect comparison, the relation of the total activity of iodine-131 and Cesium-137 in case of MDBA of EIA of the Belarusian Nuclear Power Plant (level 4) and EIA of the Lithuanian Nuclear Power Plant (level 5) is equal to 750 instead of more than by 4 thousand times of which the authors of «Critical Remarks …» state.

<table>
<thead>
<tr>
<th>Isootope</th>
<th>0-8 h</th>
<th>8-24h</th>
<th>24-96 h</th>
<th>96-720h</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krypton-85</td>
<td>3,44E+16</td>
<td>1,71E+16</td>
<td>1,13E+16</td>
<td>2,04E+16</td>
<td>8,32E+16</td>
</tr>
<tr>
<td>Iodine-131</td>
<td>5,25E+13</td>
<td>2,08E+13</td>
<td>6,85E+13</td>
<td>2,07E+14</td>
<td>3,49E+14</td>
</tr>
<tr>
<td>Cesium-134</td>
<td>5,33E+12</td>
<td>5,99E+10</td>
<td>0,00E+00</td>
<td>0,00E+00</td>
<td>5,40E+12</td>
</tr>
<tr>
<td>Cesium-137</td>
<td>3,03E+12</td>
<td>3,41E+10</td>
<td>3,70E+07</td>
<td>0,00E+00</td>
<td>3,06E+12</td>
</tr>
<tr>
<td>Tellurium-132</td>
<td>5,22E+12</td>
<td>6,33E+10</td>
<td>3,70E+06</td>
<td>0,00E+00</td>
<td>5,29E+12</td>
</tr>
<tr>
<td>Strontium-90</td>
<td>1,45E+11</td>
<td>1,89E+09</td>
<td>0,00E+00</td>
<td>0,00E+00</td>
<td>1,47E+11</td>
</tr>
<tr>
<td>Cobalt-60</td>
<td>5,88E+08</td>
<td>7,40E+06</td>
<td>3,74E+04</td>
<td>0,00E+00</td>
<td>5,96E+08</td>
</tr>
<tr>
<td>Ruthenium-106</td>
<td>9,88E+10</td>
<td>1,28E+09</td>
<td>0,00E+00</td>
<td>0,00E+00</td>
<td>9,99E+10</td>
</tr>
<tr>
<td>Americium-241</td>
<td>2,78E+06</td>
<td>3,61E+04</td>
<td>0,00E+00</td>
<td>0,00E+00</td>
<td>2,81E+06</td>
</tr>
<tr>
<td>Plutonium-239</td>
<td>1,48E+07</td>
<td>1,92E+05</td>
<td>0,00E+00</td>
<td>0,00E+00</td>
<td>1,50E+07</td>
</tr>
</tbody>
</table>

As it was spoken above, the given values cannot be compared, since they relate to various kinds of accidents.

For the reference of the authors of "Critical Remarks". The accident at Three Mile Island: As a result the temperature in a reactor zone has reached 2273 K which has led to the damage of a design and fusion of 50 % of fuel. Only in two hours after the accident beginning it has been revealed that bypass valve of pressure release is open and water from a zone flows down to the reserve capacity which is situated in auxiliary premise.

The cooler leak have been stopped by closing of manually operated gate valve and repeated switching on of high pressure pumps. By these actions it was possible to cool the active zone quickly. Fusion of a part of the active zone of a reactor has led to penetration of decay products into not-destroyed case of a reactor and into the cooling system. It has been emitted about 10^17 Bq of radioactivity consisting basically of the rare gases ^133_Xe, ^133m_Xe and ^136_Xe, and about 1,1 TBq ^131_I.

The analyses of tests of air, milk, water, fish, agricultural products, soil, vegetation and bottom deposits for radioactivity have shown that basically pollution was caused by radioactive rare gases and ^131_I. ^131_I has been detected in the cow and goat milk and in technical water, and ^137_Cs - in fish. It is supposed that the highest doses for several
days right after the accident were received by 260 persons working within the radius of 3.2 km from the Nuclear Power Plant (0.2-0.7 mSv). The rated collective dose of irradiation for the population within the radius of 80 km from the Nuclear Power Plant amounted to 20 people-3v.

**Question 3. THE SIZE OF THE ZONE OF POSSIBLE INFLUENCE AND RADIATION DOSES HAVE BEEN ESSENTIALLY UNDERESTIMATED. ACTIONS FOR POPULATION PROTECTION HAVE NOT BEEN PROVIDED FOR.**

The consequence of understating of the scales of the accidents - statements about absence of necessity to plan the emergency evacuation, resettlement, iodine prevention and other measures on population protection. Underestimation of possible emissions of radionuclides at the maximum design-basis accident (MDBA) by four thousand times and underestimation of possible emissions at serious out-of-design accidents (ODA) by 10-320 times gives the possibility to the developers of EIA to considerably underestimate estimation of influence of such accident on environment and health of people.

**RESPONSE:** At calculation of the consequences of MDBA and ODA at the Nuclear Power Plant the authors were guided not only by the International documents and specifications, but also by the world experience received for the period of exploitation of the Nuclear Power Plants in many countries. The emissions for two types of accidents under consideration have not been purposely underestimated, but have been chosen as the most probable for the chosen type of a reactor of generation 3+.

In the documents of the International Atomic Energy Agency «IAEA - THDCDOC-1432. Development of an extended framework for emergency response criteria» the criteria for carrying out of protective and other actions in case of nuclear accident (p.12) are specified:

1) if the predicted absorbed dose of irradiation of a thyroid gland exceeds 50 mGy, carrying out of iodine prevention is necessary;
2) if the predicted total effective dose of irradiation exceeds 100 mSv, shelter, evacuation and introduction of prohibition for consumption of the polluted foodstuffs, milk and water are necessary.

The calculated predicted doses of irradiation do not exceed the specified criteria in case of MDBA which allows to make a substantiated conclusion about absence of necessity of carrying out of protective actions.

The authors of «Critical Remarks ...» assert that the values of possible doses of irradiation which the population will receive in case of out-of-design accident have been substantially reduced. This is not true, since radiation doses have been calculated taking into account the most probable values for the chosen type of a reactor of radioactive emission, and also with use of the international models of calculation. Moreover, in the course of estimation the following conditions of course of accident have been chosen:

1) Has been chosen ground emission. The given variant of development of events leads to higher doses of radiation as compared with the variant of high-altitude emission.
2) The filters do not operate, the irrigation is disconnected. Thanks to this there is no reduction in the general emission of concentration of iodine and-or other flying fission products.
3 The worst variants of meteoconditions which are the most adverse for dispersion of radioactive emission have been chosen.

4 The spring-and-summer period of year has been chosen which worsens the scenario of the course of the accident, since during this period of the year the population uses leaf vegetables and greens, and the livestock passes to the pasture keeping that leads to additional internal irradiation at the cost of consumption of the polluted milk and vegetables.

The whole above-mentioned parameters lead to higher doses of irradiation of the population.

The authors of «Critical Remarks …» have noticed that because of unreasonable underestimation of the consequences of possible accidents the materials of EIA do not contain even mentions of the necessity of iodine prevention. This statement is erroneous, since in EIA there has been stated that iodine prevention is the necessary protective action, but also there has been shown at what distance from the Nuclear Power Plant it should be carried out (up to 25 km), as well as other protective actions in case of ODA have been offered:

- To provide the possibility of introduction of restriction on consumption of milk and other foodstuffs potentially polluted with radionuclides;
- To provide for the possibility of urgent carrying out of monitoring of environment, foodstuffs and food for animals at a distance at least 30 km from the NPP;
- To provide for carrying out of monitoring of foodstuffs in the whole territory of the Republic of Belarus.

In EIA the zones of emergency planning of the measures on population protection also have been offered. In the International standard document «Methods of Development of the Actions on Reaction on Nuclear Milli Radiological Emergency» which has been developed and published by the International Atomic Energy Agency as long ago as in 1977, the following sizes of zones of emergency reaction and radiuses for the reactors with thermal capacity above 1000 MW (p.168) being offered by the International Agency have been marked:

- Radius of precautionary measures zone - 3-5 km;
- Radius of a zone of planning of urgent protective measures - 25 km;
- Radius of planning of restrictions concerning foodstuffs - 300 km.

Question 4. ESTIMATION OF INFLUENCE OF OUT-OF-DESIGN ACCIDENT ON LITHUANIA IS UNDERSTATED. THERE IS NO ESTIMATION OF INFLUENCE OF OUT-OF-DESIGN ACCIDENT ON BELARUS.

Understating of emissions of radionuclides at out-of-design accident by tens, and even by hundred times has led to essential understating of estimation of the consequences of such accident for Lithuania. It is not clear why there is no estimation of the consequences of out-of-design accident for the territory of Belarus.

RESPONSE: In EIA of the Lithuanian Nuclear Power Plant, Table 10.4-4, p.545 the protective measures which are stated in the Table P.43 have been considered.

Table P.43

<table>
<thead>
<tr>
<th>Measures</th>
<th>Accident LOCA, INES Level 5</th>
<th>TA, INES Level 6</th>
</tr>
</thead>
</table>
In Table 28, p. 103 of EIA of the Belarusian Nuclear Power Plant the pollution of the territory of the Lithuanian Republic at rated emission on iodine-131 equal to 1,0 E+14 and on Cesium-137 = 1,0E+13 Bq is established. It is necessary to take into consideration that the distance to the border of the Lithuanian Republic is 23 km, therefore such values of density of pollution of the territory exist.

The forecast of transboundary influence of the Belarusian Nuclear Power Plant on the Lithuanian Republic by transfer of radioactive and chemical pollution by surface and underground waters is presented in the corresponding sections of «Statements …»:

5.2. The forecast of potential transboundary influence of the Belarusian Nuclear Power Plant for surface waters.

5.3. The forecast of possible transboundary pollution by underground waters.

5.4. Radiation doses for the population at out-of-design accidents.

The actions described in section 5.4.1. "Protection of the Population at Emergencies" are similar to the actions provided in the above-mentioned Table 10.4-4.

In the working papers of EIA of the Belarusian Nuclear Power Plant, Book 4, Section 9 «Soils. Agriculture. Estimation of Radiation Influence on Agricultural Systems» estimation of radiological influence on agricultural systems in a mode of normal operation of the maximum design-basis accident and out-of-design accidents and the basic protective actions are represented.

It is necessary to notice that in the course of working out of the given questions the "sad" experience of Chernobyl accident received as a result of carrying out of actions for liquidation of its consequences in the territory of Belarus since 1986 in respect of:

- Conducting of agroindustrial production under conditions of radioactive pollution of lands;
- Monitoring of underground waters in the points of holding of radioactive waste has been taken into consideration.

**Question 5: CHOICE OF THE RUSSIAN PROJECT OF THE NUCLEAR POWER PLANT-2006 IS NOT GROUNDED.**

The developers of EIA do not submit the data of the problems at the Nuclear Power Plant with reactors of the Russian construction and are uncritical to the advertising products of the Russian nuclear industry.

**RESPONSE:** The basic manufacturers of the Nuclear Power Plants and the indicators of reliability of the nuclear plants are stated in Tables 5,6, p. 29 «Statements …». The most interesting offers on construction of the Belarusian Nuclear Power Plant have been received from the Russian part. It is natural that on the terms of agreement between the Government of the Republic of Belarus and the Government of the Russian Federation for the Belarusian Nuclear Power Plant the Nuclear Power Plant project - 2006 with a reactor of generation 3+ has been chosen.

As for the claims to the quality of the materials and equipment it is possible to state the following information on construction of power blocks EPR -1600 Olkiluoto-3, Finland, and Flamanville-3, France:
- Block Olkiluoto-3 has been detained for three years, the losses of 2.4 billion euro;
- The French regulating body has found out the problems with the system of quality of the subcontractors who produced heavy equipment for Flamanville-3;
- Constant completions of the documentation conduct to violation of the dates of execution of orders for block Olkiluotto-3 with reactor EPR-1600. Many things are being finished actually in the course of construction.
- EPR-1600 is the world’s first block and it is being constructed after 15 year breaks in nuclear projects.

The stated examples show that in the course of construction the regulating bodies pay special attention to the issues of quality of the materials and equipment which finally define safety of the Nuclear Power Plant.

As for the Tianwan Nuclear Power Plant, on September 23, 2009 in Lianyungang (People's Republics of China) the negotiations have been conducted between Atomstroyexport Close Corporation (ASE Close Corporation) and JNPC in connection with expiration of the term of guarantee operation of the second block of the Tianwan Nuclear Power Plant.

The Parties have signed the joint "Report of Negotiations on Issues of Final Acceptance of Block 2 of TNPP" according to which two-year guarantee period of operation of the second block of the Tianwan Nuclear Power Plant is considered to be expired. The Report has been signed on the Russian part by the First Vice-President of Atomstroyexport Close Corporation Mr. Alexander Nechaev, on the Chinese part – The Director General of JNPC Tsien Goyuang.

The similar Report of final acceptance on the expiration of a warranty period of operation of the first block of NPP has been signed in June of this year.

The guarantee period of operation has shown a reliable operation of the Nuclear Power Plant. Both power blocks of the Tianwan Nuclear Power Plant operate stably at the level of nominal contract capacity of 1060 MW and have high technical and economic indicators. From the moment of start-up of the two first blocks the Nuclear Power Plant has developed more than 30 billion of kW×hours of electric power. The Tianwan Nuclear Power Plant being constructed as per the advanced Russian project is the most safe among the Nuclear Power Plants operating in the People's Republic of China.

The General Contract on construction of the Tianwan Nuclear Power Plant has been signed by Atomstroyexport Close Corporation and JNPC in 1997. Execution of obligations on Nuclear Power Plant designing, delivery of the equipment and materials, construction and installation works, commissioning of the Nuclear Power Plant, training of the Chinese personnel has been assigned to Atomstroyexport Close Corporation.

The first stage of the Tianwan Nuclear Power Plant includes two power blocks with plants PWR-1000. As the general contractor, Atomstroyexport Close Corporation has united more than 150 Russian Enterprises and scientific organizations for realization of the project. Installation works in the buildings of "nuclear island" have been executed by the subcontractor – the 23-rd Chinese Building Corporation of the nuclear industry, the part of equipment has been also produced in the People's Republic of China.

Concerning the remarks of Rostechnadzor. We will submit below the extracts from the annual report on activity of the Federal Service on Ecological, Technological and Nuclear Supervision in 2005. In 2005 there were 40 failures in operation of the Nuclear Power Plants which are subject to registration according to the Regulations on the order of investigation and registration of failures in operation of nuclear power plants, which is by 6 failures less than in 2004.

There have not been violations of conditions and limits of safe operation of the Nuclear Power Plant, all the failures have been classified as per the scale INES by zero level.
Distribution of failures in operation of the NPP on immediate causes is stated in the Table P.44.

### Table P.44

<table>
<thead>
<tr>
<th>Immediate Causes of Failures</th>
<th>Year 2005</th>
<th>Year 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mechanical damages</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>2. Malfunctions in electrotechnical systems</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>3. Chemical effects or effects connected with reactor physics</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. Hydraulic influences</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5. Malfunctions in testing equipment</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>6. Environment (internal influences — abnormal conditions at the NPP)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>7. Environment (external influences — abnormal conditions outside the NPP)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8. Human factor</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>40</strong></td>
<td><strong>46</strong></td>
</tr>
</tbody>
</table>

The greatest number of failures in operation of the NPP in 2005 has been caused by mechanical damages of equipment and malfunctions of the electric systems and human factor.

Distribution of failures in operation of the NPP are stated in the Table P.45.

### Table P.45

<table>
<thead>
<tr>
<th>Basic Cause</th>
<th>Year 2005</th>
<th>Year 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Implementation error</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>2. Design error</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>3. Manufacturing defect</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4. Construction defects</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. Installation defects</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>6. Adjustment defects</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>7. Defects of repair being executed by third-party organizations</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8. Drawbacks of project, design and other documentation</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>9. Defects of control of the NPP and drawbacks of exploitation organization</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>10. Has not been established</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>40</strong></td>
<td><strong>46</strong></td>
</tr>
</tbody>
</table>

The greatest quantity of failures in operation of the Nuclear Power Plant in 2005 has been caused by design errors, defects of control and drawbacks in organization of
operation. The presented material shows that despite of failures in operation of the Nuclear Power Plant which is also typical for other industries, within 2005 there have not been registered any failure of level 1 and above as per scale INES which testifies of the requirements to the issues of ensuring nuclear and radiation safety being lodged to the nuclear power objects.

**Question 6: THERE IS NO ESTIMATION OF INFLUENCE OF DISPOSAL OF THE NUCLEAR POWER PLANT**

In EIA there is no estimation of influence of the inevitable stage of a life of the Nuclear Power Plant - its disposal. This is an expensive and dangerous process at which the considerable quantity of radioactive waste is being formed, accidents and essential influence on environment are possible.

**RESPONSE:** In "the General Provisions of Ensuring Safety of Nuclear Power Plants " (GPS-88/97) it is stated that disposal of the power block is the process of realization of a complex of actions after removal of the nuclear fuel excluding its use as the energy source and providing for safety of the personnel and environment.

In Book 3, Section 3 «Nuclear Power Plant Description. Characteristic of the Sources of Influence of the Nuclear Power Plant on Environment» of the working papers of EIA of the Belarusian Nuclear Power Plant the issue of disposal of the power block is being considered in Section 3.8. In the section the following issues have been considered:

- The conceptual approach to the problem of disposal of the Nuclear Power Plant;
- Ecological safety of the power block subject to disposal.

The conceptual approach to the problem of disposal of the Nuclear Power Plant consists in the following. The project of disposal of the power block is being carried out for approximately 5 years prior to the expiry of the term of service of the power block taking into account the results of pilot survey of its condition, experience on disposal of power blocks with similar reactors and should be the basic document on the basis of which all the basic stages of disposal of the power block of the Nuclear Power Plant are being carried out.

By the beginning of working out of the specified project it is necessary to perform the following research and developmental works:

- Research on the choice of the optimum variant of disposal with technical and economic study of the alternative variants and a technical substantiation of the accepted variant;
- Inspection and certification of the equipment and premises;
- Analysis of radiation conditions and radionuclide structure of the coolant and the contaminated equipment;
- Estimated-experimental definition of the volume of activity of the equipment;
- Estimation of the total quantity and category of radioactive waste being formed in the course of disposal;
- Working out of the standard documentation regulating design works on disposal;
- Working out of the methods of control of radiation and ecological conditions in the course of deactivation and equipment dismantling;
- Development of the system of radiation protection and radiation control of the technological process of disposal;
- Radiological research, working out of techniques and mathematical models for estimation of a collective dose of irradiation of the personnel at disposal, calculation of the assumed dose expenses for carrying out of the basic technological operations;
- Research and working out of the methods of creation of the working zones, hermetic sealing of the premises and in the course of dismantling of heavy-polluted and activated structures;
- Working out of the methods of handling the radioactive waste being formed in the course of disposal, and the complex technological system of processing, removal, storage and burial of radioactive waste, transfer of small-active waste to the category being used without restrictions;
- Working out of the technological means of equipment of technological operations on deactivation, fragmentations, meltdown, compaction of metal and nonmetallic radioactive waste;
- Working out of the organizational and technical principles, nomenclatures of a special equipment and special instruments for dismantling of highly active structures, systems and the large-size equipment (the reactor case, intracase devices of reactor plant, steam generator etc.), including remote complexes;
- Working out of functional technologies of dismantling of the equipment of a reactor and premises of reactor compartment;
- Working out of a plan of measures on protection of the personnel and the population in case of occurrence of the accident in the course of works on disposal and the complete set of documents (instructions) on the actions of the personnel who carry out dismantling works in case of emergency.

In the course of working out of the project of disposal of the power block of the Nuclear Power Plant the regular systems available at the given power block, equipment, vehicles, protective and sanitary-and-hygienic barriers should be used as much as possible.

They are as follows:

- The systems of power supply, heating systems, sewerage systems, water-supply systems, radiation control systems, sanitary barriers, systems of forced and exhaust ventilation with clearing filters, transport devices and load lifting mechanisms;
- The regular transport-technological facilities which ensure execution of all operations with nuclear fuel and radioactive units of reactor plant;
- Deactivation baths of the radioactive equipment and the system of preparation of deactivating solutions;
- The regular systems of collection, concentration, hardening and burial of a liquid and solid radioactive waste, the systems of removal and burial of aerosol filters of the system of ventilation;
- Bidirectional radio paging and telecommunication;
- The information on influences on the systems and equipment at exploitation of the block the data on which are being stored in the Nuclear Power Plant archive.

For execution of the works on disposal of the power block of the Nuclear Power Plant upon expiration of the target date of service with the least expenditures of labour in the project the following technical decisions directed also at decrease of radiation doses of the personnel should be taken:
- The shortest routes of traffic of radioactive waste and the equipment;
- The indoor transport bridges for transportation of the "contaminated" equipment and its units by means of floor-level transport should be accepted;
- Protective containers and the equipment for collection, sorting, transportation and processing of radioactive waste should be applied;
- The systems and equipment providing for radiation control at the industrial site and within a sanitary-protective zone of the Nuclear Power Plant should be provided for;
- The configuration of all the buildings and structures should provide for placing of all basic and auxiliary equipment, armature and pipelines in the course of division into units during disposal of the power block within the ranges of operation of load lifting mechanisms which provide for lifting and transportation of equipment (of the unit or its components) from the place of installation to the ground vehicles with a minimum quantity of transshipments;
- The repair and exploitation systems of ventilation and recycling units have been provided for;
- The bidirectional radio paging and telecommunication of the Nuclear Power Plant has been provided for;
- Installation sites for containers for collection and removal of radioactive waste are provided for;
- The unit of preparation of decontaminating solutions and decontamination site of special transport and protective containers, as well as portable means and adaptations for decontamination are provided for;
- The information on influences on the systems and equipment at power block operation should be registered and documented operatively and should be stored in Nuclear Power Plant archive;
- Possibility of creation of the working areas is provided for.

The project provides for the possibility of implementation of the following variants of disposal of the power unit:

- Power unit liquidation (liquidation of the power block after its conservation within ~30 years);
- Power unit burial.

Conservation of the power block within 30 years is caused by the following: In the course of exploitation as a result of interaction with neutrons activation of constructional materials of the first contour takes place – the core, a part of the case of the reactor. The basic product of activation is cobalt-60 with a half-life period of 5.27 years. Conservation for 30 years (6 half-life periods) leads to considerable decay of the given radionuclide (1.95% of activity is left) and considerable reduction of radiation exposures on the personnel at carrying out of dismantling works. Besides, after conservation radioactive waste pass to the class of low-activity waste.

**Ecological Safety of the Power Unit being Disposed**

Preservation of the power unit of the Nuclear Power Plant is provided for by hermetic sealing of locks, doors and hatches of all the premises of the power unit through which radioactive substances can spread outside the limits of a zone of engineering control, as well as prohibition of unauthorised access of the personnel to these premises.
The ecological safety of the power unit subject to disposal is being ensured by the following measures:

- Reactor shutdown, suppression of the nuclear chain reaction and transition from normal operation to removal of residual thermal emissions from the core of the reactor and spent fuel assemblies being in the intrareactor storage. Heat removal from the core of the reactor and spent fuel assemblies is being ensured by operation of the system of normal and emergency reactor shut-down cooling which has been designed on the passive principle of operation;
  - Discharge of the spent nuclear fuel from the reactor;
  - Transportation of the spent and seasoned nuclear fuel for processing.

After removal from the power unit of the seasoned spent nuclear fuel danger on it is being completely eliminated, and radiation safety is being provided for by the strict observance of the requirements of the specifications and technical documentation which will operate at the moment of disposal of the power unit of the Nuclear Power Plant with use of regular systems of special ventilation and special sewerage system.

Decommissioning of the buildings and structures can contain the following stages:

- Equipment dismantling, its decontamination in case of necessity, sending for air-conditioning and storage or for further use in the national economy;
- Dismantling of the building structures, sending of them for air-conditioning and storage, or for further use in the national economy.

Dismantling of the systems of special ventilation and special sewerage system should be executed in the course of disposal of the basic process equipment.

Control over observance of the norms of radiation safety at the stage of conservation of the power unit and its liquidation is provided for as in the period of operation by means of a regular system of radiation control which carries out collection and processing of the data on parameters of the radiation control and submits it on control stations.

According to its designation the system of radiation control is subdivided into 4 interconnected systems:

1 radiation technological control;
2 radiation radiation control;
3 individual dosimetry control;
4 radiation control of environment around the Nuclear Power Plant.

The issue of the cost of disposal of the power unit is not the subject of consideration of EIA which is being proved by EIA of the Lithuanian Nuclear Power Plant, the Leningradskaya, the Baltic, the Nizhny Novgorodskaya, the Severskaya, the Novovoronezhskaya and the Khmelnitskaya Nuclear Power Plants.


The Section «System of Handling of Fuel and Its Storage» on p. 47 inadequately describes the possible variants of handling of SNF. Nothing has been told about return of fuel-processing waste from Russia and the necessity of construction of one more mortuary.

RESPONSE: On p. 47 it is written that according to the Russian legislation the spent nuclear fuel after conservation of at least 3 years in a cooling pond can be re-
moved from the building of a reactor of the power unit to the factory of reprocessing of nuclear fuel or for long-term storage. The given issue will be described in detail in the corresponding documents.

The competency of such conclusion is being proved by the fact that Russia systematically returns from the third countries both new fuel and irradiated fuel from the research nuclear reactors. This fuel has been delivered in the days of the Soviet Union within the framework of the programs on scientific and technical cooperation. Since year 2005 nuclear fuel from Libya, Uzbekistan, Czechia, Latvia, Poland, Vietnam, Hungary and Kazakhstan have been returned to Russia.

Question 8: IN EIA THE FACTS WHICH PROVE THAT EVEN ACCIDENT-FREE OPERATING NUCLEAR POWER PLANTS ARE DANGEROUS

At normal operation of the Nuclear Power Plant emissions of radionuclides through ventilation pipes lead to growth of the number of cancer diseases round the Nuclear Power Plant. The developers of EIA do not know this or deliberately do not cite the scientific data of the German and American researchers.

RESPONSE: By the Project of the Belarusian Nuclear Power Plant it is provided for that radiation impact on the population and environment at normal operation is being maintained below of the established standard limits. For the NPP being projected or constructed in the world practice the quota on population irradiation is being established as a rule, 100 µSv/year. The given quotas are being established for a total irradiation of the population from radioactive emissions in atmosphere and discharge of liquid radioactive waste to the surface waters as a whole for the Nuclear Power Plant, irrespective of the quantity of power units on the industrial site. According to the radiation standards of the Republic of Belarus (RS-2000) the established limit of a dose of irradiation from all the sources of irradiation should not exceed 1 mSv/year (1000) on the average for any consecutive 5 years, but maximum 5 mSv/year. As a result of a normal operation of the Nuclear Power Plant the doses of an irradiation will not exceed the tenth part of the established limit.

According to the International approaches it is possible to assume occurrence of stochastic effects at the doses of irradiation which constitute parts of Sv, i.e. 100-1000 mSv (100 000 - 1 000 000 µSv) since the dose of 100 000 µSv can theoretically lead to increase (about 0,5 %) the frequency of development of cancer diseases. The maximum risk of death at irradiation with the dose of 0,1 Sv (100 000 µSv) is almost by 15 times below the risk of death from unirradiated population.

However at carrying out of radiation-induced cancer disease incidence it is impossible to exclude absolutely all numerous factors which cause cancer diseases: various chemical substances, bad habits, poor-quality foodstuffs, viruses etc. Is is necessary for understand that there is a lot reasons for cancer diseases, and for receipt of the authentic data it is necessary to carry out qualitative epidemiological research of disease incidence among a great cohort of the population which at such scanty doses should amount to billions of irradiated persons under control. Capacity of sampling (quantity of a surveyed cohort of the population) depends on the received doses of irradiation and the value of the factors of risk.

The examples of the received results of research of increase of cancer diseases among the population living close to the nuclear power plants/stations stated in the remarks cannot be accepted as the absolute proof of interaction between the population irradiated by scanty doses and increase of cancer diseases incidence.
Question 9: IN EIA THERE IS NO EITHER DESCRIPTION OF THE SYSTEM OF HANDLING OF RADIOACTIVE WASTE OR INFLUENCE OF POSSIBLE ACCIDENTS AT HANDLING OF RADIOACTIVE WASTE ON ENVIRONMENT AND HEALTH, AS WELL AS THE DESCRIPTION OF INFLUENCE OF STOREHOUSES AND MORTUARIES.

EIA does not contain the exhaustive description of the measures on safety ensuring at discharge, storage and processing of radioactive waste and descriptions of possible accidents at these stages and the measures on minimization of their consequences.

RESPONSE: In the working papers of EIA, Book 3, Section 3 «Description of the Nuclear Power Plant. The Characteristics of the Sources of Influence» the following issues have been considered:

- Radiation impact:
  1) Emissions of radioactive gases and aerosols from the NPP:
     The gas-aerosol waste of the power unit and exhaust air from premises from the zone of the controlled access (ZCA) purified of radioactive contamination are being emitted in environment through a high-rise ventilation pipe. The pipe is situated on the rigging of reactor compartment, a top mark – at least 100 metres. The pipe design is intended for OBE and is not intended for crash of an airplane. The control over emissions is being carried out continuously by the automated system of radiation control (ASRC).
     The additional sources of possible inflow of radioactive substances in atmosphere from free-access zone are the exhaust air of the building of the turbine and removal of a steam-air mix from the turbine condensers. The ventilation emission from the turbine building is organized above the roof.
     The balanced scheme of the possible inflow of radioactive gases and aerosols in atmosphere at long-term operation of the power unit with reactor units B-392M under conditions of normal operation (NO) is stated.
     At operational violations at the NPP being accompanied with additional emission of radioactive substances to the air of technological premises the low level of radioactive isotopes of iodine and aerosols in gas-aerosol ventilation emission is being maintained at the cost of the effective filtration of the exhaust air from the premises of ZCA of the auxiliary buildings and structures.

   For the Nuclear Power Plant in the Russian Federation the restrictions on emissions of radioactive gases and aerosols in environment at a level of permissible discharge (PD) being regulated by SP AS-03 have been established. The value of PD is being established with regard to the quota on irradiation of the population equal to 50 µSv/year.
   As per the data of Rostechnadzor in 2005 gas–aerosol Nuclear Power Plant emissions were lower than PD and did not exceed the levels established by SP AS-03, namely: on IRG - 20,5 % (the Bilibinskaya Nuclear Power Plant), I-131 - 9,4 % (the Novovoronezhskaya Nuclear Power Plant), Co-60 - 10,1 % (the Smolenskaya Nuclear Power Plant), Cs-134 - 4,6 % and 3,6 % (the Novovoronezhskaya and Leningradskaya Nuclear Power Plants) and Cs-137 - 7 % (the Novovoronezhskaya Nuclear Power Plant).
   The cases of exceeding of emissions of radionuclides for a day and for a month above the values of the reference levels regulated by SP AS-03 have not been revealed.
2) Discharges of radioactive substances from the NPP.

After the radiation control which is being carried out by the gauges of the automatic system for technological radiation control (ASTRC) in control tanks and the analysis of tests in the radiochemical laboratory unbalanced waters of the NPP from a zone of the controlled access (ZCA) are being discharged. If necessary water from control tanks is being delivered for repeated purification to the system of trapped waters processing. The balanced network of possible inflow of radioactive substances in hydrosphere resulted from long-term operation of the power unit in a normal operation mode is represented.

The permissible discharge (PD) is being calculated on the basis of dose quota of irradiation of the population equal to 50 µSv/year.

According to Rostechnadzor in 2005 the permissible discharges of the Nuclear Power Plant were lower than the permissible levels and did not exceed 18.9% of the value of PD (the Novovoronezhskaya Nuclear Power Plant).

Handling of Radioactive Waste

The given Section includes the information on the following issues:

- The sources of radioactive substances at the NPP. The information of the barriers limiting spread of radioactive gases and aerosols from the NPP is provided for. It has been noted that for all conditions of operation of the Nuclear Power Plant in the project the values of operational limits and the limits of safe operation are being established which characterise the state of the systems (components) and the Nuclear Power Plant as a whole and allow to guarantee the control of integrity of the barriers and, first of all, the covers of fuel elements and, thus, to prevent a considerable exit of the fission products from fuel to the coolant of the first contour and further to the premises of the NPP with the basic process equipment.

- The activity of the coolant of the first and second contours.

Maintenance of design value of the specific activity of the coolant of the first contour at acceptable low level (370 MBq/kg) is being ensured by:

- Constant degasation of the coolant of the first contour;
- Constant blow of the coolant of the first contour through ion-exchange filters;
- Removal of the coolant in a mode of boric regulation through ion-exchange filters with the subsequent processing and discharge through ion-exchange filters to the tanks of a boric concentrate.

The data of operation of the domestic and foreign Nuclear Power Plants with water-moderated water-cooled power reactors show presence of insignificant quantity of unpressurized fuel elements (1-5 fuel elements) at operation of the blocks which is considerably lower than the operational limit being regulated by Nuclear Safety Rules PY-89 for the Nuclear Power Plant with PWR (about 100 fuel elements which have gas leakage, and 10 fuel elements - direct contact with fuel).

- The Characteristic of Radioactive Waste

The liquid radioactive waste are as follows: a concentrate of salts (vat residue), slimes and pulps of the spent filtering materials being formed in the course of processing of LRS and operation of the special water purification plants. According to the mod-
ern requirements in the project the technologies and the technical decisions providing for minimization of the volumes of LRW being formed have been provided for. A waste relate to low - and medium-active waste according to SP AS-03 classification.

The solid radioactive waste are the spent process equipment and filters of the system of ventilation, tools, working clothes as well as hardened liquid radioactive waste. In the project the technologies and the means providing for processing, safe storage and transportation of the solid radioactive waste have been provided for. The SRW being formed except for intrareactor (a category of highly active waste) relate to low - and medium-active waste according to SP AS-03 classification.

Gaseous radioactive waste are as follows: technological gas blowouts from the equipment and the tanks containing the coolant of the first contour, gas blowouts of the tanks of auxiliary systems, as well as the air of the systems of ventilation of a zone of the controlled access.

- Systems of Handling of Liquid Radioactive Waste

In the course of operation of the Nuclear Power Plant the liquid radioactive substances are being formed which are subject to collection and processing in the process of which liquid radioactive waste are being formed. At creation of the concept of handling of liquid radioactive substances the task of minimization of quantity of liquid radioactive waste being formed has been set. For this purpose the Project contains a number of the technical decisions directed at minimization of formation of the volumes of LRS and decrease of saline content:

- Separate collection of radioactive substances depending on activity, saline content and chemical composition, use in technology of special water purification of ion-collecting sorbents;
- Application of low-waste methods of decontamination and mobile modular installations of decontamination;
- Refusal from regeneration of filters of purification of low-saline medium-active waters;
- Use of the purified edge water only for feeding of the 1-st contour.

Decontamination of the liquid radioactive substances (trapped waters) is being carried out at evaporator system. As a result of processing of the trapped waters the pure condensate is being formed being reused in a cycle of the Nuclear Power Plant, and saline concentrate (vat residue) being the LRW.

For intermediate storage and subsequent processing of LRW the following systems are being provided for:

- The system of intermediate storage of vat residues and spent sorbents;
- The system of conditioning and hardening of liquid radioactive waste.

The system of intermediate storage of LRW provides for exposure of LRW for at least 3 months for the purpose of decrease of the level of radioactivity at the cost of decay of short-lived radionuclides.

For receipt of the hardened product subject to final burial the Project provides for the system of hardening of LRW. The system provides for the possibility of concentration of the vat residue, its hashing with cement and packaging of the cement compound to concrete non-recycled protective containers NZK-150-1,5P (S).
Non-recycled protective containers are intended for temporary storage of the radioactive waste on the site of the Nuclear Power Plant and subsequent transportation to the regional centres for long-term storage.

Thanks to application of low-waste technologies and optimization of the technological decisions the predicted volume of the hardened LRW on the Nuclear Power Plant -2006 on the site of LNPP-2 will amount to approximately 30 m$^3$/year which is significantly lower than on the operating Russian Nuclear Power Plants with water-moderated water-cooled power reactors.

- Systems of Handling of Solid Radioactive Waste

Processing and storage of SRW is being carried out in a building for processing and storage of solid radioactive waste.

In the course of normal operation and carrying out of repair work on the Nuclear Power Plant the following solid radioactive waste are being formed:

- Parts and equipment being removed from a reactor (mechanical parts of ШЭМ electric drives, КНИТ gauges and ИК suspension mounts and their communication lines, etc.);
  - The contaminated dismantled equipment, pipelines and armature not subject to repair;
  - The contaminated tools;
  - The contaminated attachments for repair;
  - The contaminated spent aerosol filters of the systems of ventilation and gas purification;
  - The contaminated working clothes, footwear, the means of individual protection which are not subject to decontamination;
  - Contaminated construction and heat-insulating materials;
  - Contaminated cleaning material;
  - Filters-adsorbers and zeolitic filters of gas systems.

The total amount of SRW taking into account their processing (pressing, cutting) on the power unit per year - 45 m$^3$ and consists of:

- low-active waste - 76 % of the total SRW volume;
- medium-active waste - 23 % of the total SRW volume;
- highly active waste - 1 % of the total SRW volume.

Collection of highly active SRW (gauges and lines «IK» and «KNIT», etc.) is being carried out on the mark of service of the building of a reactor during shutdown of the power unit at carrying out of preventive overhaul by means of the special equipment.

The specified equipment and containers provide for observance of the requirements of the radiation standards in the course of handling of SRW for protection of the personnel.

For compaction of low- and medium-active SRW at the Nuclear Power Plant the following installations will be used:

- Pressing installation;
- Crushing installation.

- Systems of Handling of Gaseous and Radioactive Waste
The system of treating of radioactive gas is intended for decrease of activity of gas release caused by blowouts from the process equipment up to permissible limits.

The system consists of two identical interchangeable working branches, and also one branch of regeneration of zeolitic filters. On the basic working branch treating of gas blowouts from vented steam of the first contour feed deaerator, blowout of the bubbler of the pressurizer, blowouts of the tank of the organized leakings of the first contour which have passed through the system of hydrogen burning are being carried out. On the auxiliary working branch treating of blowouts from the tanks of the systems of storage of the coolant, "pure" condensate storage tanks, the tank of boron-containing drainages.

The system of treating of gas blowouts from the tanks of auxiliary systems is intended for restriction of activity of emissions to the atmosphere of the gases caused by technological blowouts from the tanks of the systems which contain liquid radioactive substances up to admissible limits.

The system is equipped with aerosol and iodic filter with high efficiency of cleaning.

In respect of the accident at “Paksh” NNP, Hungary, mentioned by the authors of «Critical Remarks …» we will note the following: In the course of the scheduled repair fuel assemblies have been dropped on the bottom of deep water pool in a separate equipment of cleaning. In view of the error in the equipment design the system of circulating cooling has been broken and fuel assemblies were overheated. This became the reason of emission of radioactive rare gases and a small amount of iodine to the reactor hall. Emission out of the site was small; the radiation levels on the site or in the nearest neighborhood did not exceed the normal levels of the background. People have not been injured, the radiation dose of the personnel was maximum 10 % of the annual dose limit.

As for the accident at “Mayak” Complex, its mention in EIA of the NPP is not lawful since in the course of processing of nuclear fuel at the Complex absolutely different technological processes are being applied.

For normal functioning of the Nuclear Power Plant time storage of radioactive waste is provided for on the site. One of the reasons why the issue of regional storehouse of radioactive waste does not relate to the Nuclear Power Plant Project is the fact that the storehouse will be intended for storage of all radioactive waste of the Republic of Belarus, including medical, technological waste of nuclear industrial technologies.

Question 10: INFLUENCE OF DISCHARGE OF LIQUID RADIOACTIVE WASTE IS UNDERESTIMATED.

Absence of estimation of influence of liquid radioactive waste discharge and inflow of radionuclides in natural reservoirs in EIA hides the important factor which negatively influences on the environment and health of people.

RESPONSE: Permissible discharge (PD) of radioactive substances has been regulated at the NPP after radiation control which is being carried out by the gauges of the automatic system for technological radiation control (ASTRC) in control tanks and the analysis of tests in radiochemical laboratory, unbalanced waters of the NPP from the zone of the controlled access (ZCA) are being discharged. If necessary water from the control tanks is being delivered for repeated treatment to the trapped waters processing system. The balanced network of possible inflow of radioactive substances to hydrosphere at long operation of the power unit in a normal operation mode is represented.
The permissible discharge (PD) is being calculated on the basis of dose quota of irradiation of the population equal to 50 µSv/year. At the Nuclear Power Plants with PWRs-1000 there is tritium in waste waters in amount of approximately 5 TBq/year. In EIA of the Lithuanian Nuclear Power Plant it is stated that the annual emissions of tritium from the Finnish Nuclear Power Plants Loviisa 1,2 and Olkluoto 1,2 are equal to 16 TBq and 2,17 TBq correspondingly which is approximately 10 % of the annual restriction of the given radionuclide for each NPP. Measurements of the specific activity of tritium in the surface waters of the lake Drukshai (INPP) within 2001-2004 have shown that its value fluctuates within the limits from 10 to 20 Bq/l. It has been noticed that tritium can be found in the objects of surface waters but its influence on the person and environment is insignificant since the effective dose for the population caused by it is less than 0,02 µzv/year which amounts to 0,04 % of the annual dose quota.

**Question 12: THE ACCIDENTS AT TRANSPORTATION OF RADIOACTIVE MATERIALS AND WASTE HAVE NOT BEEN CONSIDERED**

The problem of transportation of nuclear materials and radioactive waste also has not been considered in the document properly.

At Nuclear Power Plant operation the following agents are being formed:

- the spent nuclear fuel;
- radioactive waste of three categories

Classification of liquid and solid waste is being carried out by the level of specific activity, for preliminary sorting of solid radioactive waste it is recommended to use the criteria on the level of radioactive pollution and on capacity of a dose of gamma radiation at a distance of 0,1 m from the surface at observance of the conditions of measurement according to the confirmed techniques:

- low-activity - from 1 µSv/h to 300 µSv/h;
- medium-active - from 0,3 mSv/h to 10 mSv/h;
- highl-activity - more than 10 mSv/h.

Any relocation of nuclear fuel is subject to the guidance of the Convention dated October 26, 1979. «Convention on Physical Protection of Nuclear Material» came into force in the Republic of Belarus on June 14, 1993 and is being regulated by a certain set of compulsory procedures, including the International procedures.

Relocation of radioactive waste is being regulated only by the interstate standard documents and is being carried out in accordance with the established procedure both for the Nuclear Power Plant waste as well as for radioactive waste of nuclear technologies being used in science, medicine, industry. Taking into account the above-mentioned, it is necessary to stop any application of nuclear technologies, including their application in medicine.

**Question 13: INFLUENCE OF COOLING TOWERS ON ENVIRONMENT HAS NOT BEEN TAKEN INTO CONSIDERATION**

Operation of evaporative cooling towers can affect the environment and health of people at a distance up to 20 km from the Nuclear Power Plant. But the developers of EIA pass over in silence.
RESPONSE: The system of cooling of the Nuclear Power Plant is intended for condensation of low-pressure steams being discharged from steam turbines. For Nuclear Power Plants with capacity of more than 1000 MW two kinds of cooling are being used: direct-flow cooling and cooling towers.

At direct-flow cooling water is being collected from natural reservoir (the lake or the sea), is being filtered and is being supplied to condensers. Usually the expenses for direct-flow system of cooling are lower as compared with those of the cooling towers since there is no necessity to build cooling towers. The direct-flow system is the most effective but it demands a natural reservoir of high capacity. The natural reservoir is being used as a heat accumulator where heat exchange with the atmosphere takes place. The thermally enriched waters makes negative impact on the ecological system of the natural reservoir.

As a part of wet cooling (cooling tower) there is a tower where heat exchange between hot water and air takes place. Cooling towers are being applied when water resources are limited. The general property of using wet cooling is formation of a cloud of steam. The advantage of these systems is insignificant influence on the state of the surrounding natural reservoirs.

In preliminary materials of estimation of influence of placing of power units № 1, 2 of Nizhniy Novgorod Nuclear Power Plant on environment the tentative estimation of influence of emissions of heat and steam of the cooling towers on a microclimate of the adjoining territories is presented. The given Project can be considered as the analogue of the Project of the Belarusian Nuclear Power Plant. For the power unit of nominal electric capacity of 1200 MW it is supposed to use evaporative cooling tower with the rated thermal load of 1717 Gkal/h and with the parameters stated below:

Geometrical parameters of the cooling tower:

- Tower height - 170 m;
- Diameter of the tower mouth - 86,8 m.

Air consumption being discharged through the tower mouth:
- In summer - 21300 m³/s;
- In winter - 22750 m³/s.

Average velocity of air-steam mixture in exit from the tower mouth:
- In summer - 3,6 km/s;
- In winter - 3,8 km/s.

The calculations show that the maximum annual average values of ground increase of specific humidity and air temperature can reach 0,0129 g/kg and 0,0133 °C accordingly at a distance from 3360 m to 4490 m from the cooling towers. The analysis of the results of calculations shows that heat and moisture emissions of the cooling towers of the Nizhniy Novgorod Nuclear Power Plant with the considered physical characteristics will not make essential influence on a microclimate of the adjoining territory since the annual average gain of land temperature and specific humidity of air is insignificant.

The received tentative estimations of the annual average values of increase of temperature and specific humidity of air in a ground layer of atmosphere are essentially less than the annual average values and interannual variability of these meteorological elements around the site of the Nizhniy Novgorod Nuclear Power Plant. The annual average temperature of air around the site is equal to 4,3 °C. On the ground of the above-mentioned it is possible to make a conclusion that the cooling towers cannot render essential influence on a microclimate of the adjoining territories.
Question 14: UNREASONABLE REJECTION OF LESS DANGEROUS ALTERNATIVES

The statements about insignificance of a share of alternative sources of the electric power in the general manufacture and absence of the tendency of its growth in item 2.4. do not square with reality and mislead the public and the decision-makers imposing the opinion on inevitability and choiceless of Nuclear Power Plant construction.

RESPONSE: On October 8, 1975 at the scientific session devoted to the 250-th anniversary of the Academy of Sciences of the USSR, the Academician Petr Leonidovich Kapitsa who has been awarded with the Nobel Prize on physics three years later, has made the conceptual report in which, with regard to the basic principles, in essence, has buried all kinds of "alternative energy", except for controlled thermonuclear fusion. If in short to state the reasons of the Academician Kapitsa, they are reduced to the following: whatever energy source to consider, it can be characterised with two parameters: power density - that is its quantity for unit of volume - and velocity of energy transmission (propagation). Product of these values is the maximum power which can be received from the surface unit using energy of the given kind. For example, solar energy. Its density is insignificant. But it is being spread with a huge velocity - velocity of light (300 000 km/s). As a result the solar energy flow coming to the Earth and giving a life to everything appears to be not at all small – more than kW for 1 sq. metre. As P.L.Kapitsa stated, at sea level with regard to the losses in atmosphere, the person can really use a flow of 100 - 200 w per 1 sq. metre. (Today the efficiency of the devices which convert solar energy to the electric power amounts to 15 %). To cover only household requirements of one household it is necessary to have a converter with area not less than 40 - 50 sq. metres. And to replace the sources of fossil fuel with solar energy it is necessary to construct along the whole land part of equator a continuous strip of solar batteries with a width of 50 - 60 km. Thus, consistently estimating the wind power engineering, geothermal power engineering, wave power engineering, water-power engineering, Kapitsa proved that all these, quite perspective in the opinion of dilletante, power sources will never make a serious competition to fossil fuel: the density of wind energy and the energy of sea waves is low, low heat conductivity of rocks limits geothermal plants to the modest scales. The water-power engineering is good in all aspects, however in order that it will be effective, mountain rivers are necessary - when the water level can be increased for a big height and thus providing for high density of gravitational energy of water, - but they are few, or it is necessary to arrange the huge areas of water basins and to spoil the fertile lands. In his Report P.L.Kapitsa’s paid special attention to the atomic engineering and has noted three main problems on its way as the main energy source for mankind.

- The problem of burial of radioactive waste;
- Critical danger of accidents at the nuclear power plants;
- The problem of uncontrolled spread of plutonium and nuclear technologies.

The authors of «Critical Remarks …» site the information on wind and solar power engineering power in New Zealand, Egypt, Japan, the EU countries, at that they do not mention that there are more favourable meteorological factors for the given kinds of power in these countries than in Belarus. On the basis of technical, geographical, climatic and meteorological factors the prospect of wind and solar power engineering in Belarus can be estimated as moderated. Very important factor for comparison of the variants of cov-
ering of perspective electric energy demand is the factor of reliability of the guaranteed generation of electric power. It is defined by the value of activity factor of the established capacity (AFEC) of the source of energy.

For the Nuclear Power Plant this parameter amounts to at least 90 %; AFEC of thermal power plant based on gas, coal, black oil fuel approaches to this value, but is lower than for the Nuclear Power Plant; AFEC of wind plants and solar energy sources does not reach 50 %.

Nevertheless in a number of these countries according to the statements of the International Atomic Energy Agency the atomic power engineering successfully develops.

In France the nuclear power provides for about 77 % of the needs of the electric power. Modernization of the existing reactors and construction of two new ones have been planned.

In Germany 29 % of the electric power is being generated by means of nuclear reactors. The plans of cessation of the nuclear industry declared under the influence of the Green Party members have been stopped.

In Great Britain the nuclear energy share in assurance of the needs for electric power amounts to 25 %. In the country 27 reactors operate.

In Belgium the share of nuclear power in supply of the country with electric power amounts to 56 %.

In Sweden by means of nuclear reactors 49 % of the electric power is being generated.

Finland where 25,8 % of energy is being generated on the Nuclear Power Plant, has approved construction of the new nuclear reactor - the first in Europe in this century.

In January of 2005 the Council of Ministers of Poland has taken the decision on construction of the Nuclear Power Plant in this country.

In Czechia the nuclear energy share in covering the needs of the country in electric power amounts to 30,5 %. The existing two nuclear reactors came in operation in 2003.

In Hungary 32,7 % of the electric power is being generated at the Nuclear Power Plant.

In Bulgaria the nuclear energy share in covering the needs for the electric power amounts to 40 %. Under EU pressing the Bulgarian Government has agreed to shutdown reactors Kozloduy 3 and 4 under condition of monetary indemnification. However the decision of the Government has been cancelled later by the Supreme Court of the country. Later on the Government took the decision on construction of the new Nuclear Power Plant.

According to the Regulations of Power strategy of Russia at favourable variant of development of economy it is supposed to carry out double increase of the share of production of the electric power at the Nuclear Power Plant in the European part.

On the Asian continent the nuclear power is on-upgrade.

At present the nuclear power of Japan provides for 25 % of the electric power of the country. By 2010 it is planned to increase nuclear energy production by 30 % which means construction of 9-12 new Nuclear Power Plants. Japan is at the third place on the established capacity after the USA and France. In its territory 52 nuclear reactors with the established capacity of 45 HW are situated.

Since 2002 China has put in operation 6 new reactors and one has been constructed in Pakistan. At present nuclear power engineering provides for about 5 % of the needs of the country in electric power. If the plans of China appear to be successful, by 2010 there will be a doubling of nuclear power capacities.

In South Korea in 2003 the nuclear power engineering provided for 40 % of the electric power of the country. In 2005 introduction of 2 new nuclear reactors is being
planned. In a long-term plan of development of power engineering in South Korea till 2015 introduction of 12 new nuclear reactors has been planned.

The above-mentioned facts testify that in overwhelming majority of the developed countries the understanding of the fact that there is no real alternative to atomic engineering came long ago.

**Question 15: COMPARISON OF IMPACT OF THE NUCLEAR POWER PLANT AND THERMAL POWER PLANT HAS BEEN CARRIED OUT NOT IN A PROPER WAY. THE POSSIBILITY OF ENERGY-SAVING, INCREASE OF ENERGY EFFICIENCY HAS NOT BEEN CONSIDERED.**

Comparison of the equipotent Nuclear Power Plants and thermal power plants has been carried out incorrectly and cannot serve as the proof of a preferable choice of the Nuclear Power Plant without consideration of all spectrum of alternative variants, such as the measures specified by the State policy on increase of energy efficiency and energy-saving.

**RESPONSE:** The authors of «Critical Remarks …» assert that the necessity of introduction of generating capacities for the country is absent. It is not so. At present the total established capacity of the energy sources of the Republic is enough for complete self-sufficiency of the Republic with the electric power, however in many cases operation of the out-of-date equipment becomes unprofitable as compared with import of electric power from the neighbouring countries since the cost price of production is higher than the cost of the imported electric power.

The general characteristic for the majority of nuclear power plants of the power supply system is increased and constantly being increased physical depreciation and obsolescence of the basic and auxiliary equipment, communications of energy transportation. Deterioration of the basic energy-producing equipment of electric and thermal networks amounts to about 60 % which testifies of the necessity of essential modernization of the basic equipment of the power supply system.

Belarus relates to the regions with sharp deficiency of fuel and energy resources. The Republic is compelled to import more than 85 % of the consumed fuel and energy resources. Practically all power resources are being imported from one country - Russia. The share of natural gas in domestic electropower branch has reached the level of 95-96 %. Thus it is necessary to consider the fact that the prices for the imported gas from Russia can increase in the nearest future. Increase of the prices for imported natural gas and electric power, duty introduction on crude oil duties can negatively affect the economic development of the Republic of Belarus.

Use of the fuel resources being extracted in the territory of the Republic (oil, associated gas, fuel peat, firewood and others ) represent only 16,8 % of the total consumption.

All this produces essential impact on the level of power safety of the Republic of Belarus.

According to the «Concept of Energy Security of the Republic of Belarus» confirmed by the Decree of the President of the Republic of Belarus increase of energy security of the country is being provided for by complex solution of a number of tasks, including:
- Decrease of the level of use of natural gas as the energy resource (first of all in electrical power engineering and heat power engineering);
- Putting into operation of the generating capacities based on fuel sources alternative to gas, including heat power plants based on coal, the nuclear power plants, as well as water power plants;
- Diversification of the import of energy carriers by directions, methods and routes of deliveries.

Among two sources (coal, atomic energy) on the basis of which basis advancing growth of production of electric power in Russia is being provided for, for Belarus the variant of introduction of the Nuclear Power Plant in power supply system is economically more favourable.

Construction of the new nuclear power plants based on nuclear fuel and coal should become the basic component of increase of power security of functioning of generating sources, including:

- The Nuclear Power Plant with capacity of approximately 2000 MW;
- A number of heat power plants based on coal with the general capacity of 800 – 900 MW.

For the purpose of regulation of load of a power supply system of the Nuclear Power Plant putting into operation of powerful highly manoeuvrable sources is required.

Along with putting into operation of the new capacities in a power supply system small heat power plants will receive further development at the industrial enterprises, in small towns and regional centres which will essentially increase reliability and profitability of their power supply.

All the decisions ataken within the framework of the Concept of Energy Security of the Republic of Belarus have been developed with regard to implementation of the policy of energy-saving and energy efficiency.

Heat power plants differ with consumption of primary power resources on characteristics of which the conditions and the form of influence of the Nuclear Power Plant on environment depend greatly.

Such kinds of primary energy sources as organic fuel, nuclear fuel, water power, solar energy, wind power, energy of inflow, waves, geothermal energy are essentially different in the ecological aspect. Table 7 contains the information only for evident representation about their relative ecological compatibility.

**Question 16: EIA IGNORES PRESENCE OF RED BOOK KINDS OF SALMON FISHES LIVING IN IMMEDIATE PROXIMITY FROM THE PROSPECTIVE SITE OF THE NUCLEAR POWER PLANT**

The Nuclear Power Plant is supposed to be constructed namely in those places where rare species of fishes come for spawning. At the same time in the Statement of EIA there is no special Section devoted to fauna, the fact of presence of Red Book fishes has been mentioned only once in one section, neither influence of emissions of the Nuclear Power Plant on salmon fishes, nor the measures directed at prevention of destruction of salmons have been considered.

**RESPONSE:** As a part of the working papers of EIA section 10 « Characteristic of Environment and Assessment of the Belarusian Nuclear Power Plant Impact on Environment, Landscapes, Flora, Fauna» has been developed.
The independent component of this Section is Subsection 10.3 "Fauna". It has been prepared by the Scientifical and Practical Centre on Bioresources of the National Academy of Sciences of Belarus.

In the specified Subsection the estimation of influence of construction and operation of the Nuclear Power Plant on fauna, including fish fauna of the region in radius of 30 km from the construction site is represented. The kinds of fishes being under protection have been separately characterised.

It is specified that Viliya River with inflows is important waterway for preservation of variety of fish fauna of the country. Seven kinds of fish under protection and one kind of fish-shaped leve here. The list of kinds of fish under protection contains Atlantic salmon, bulltrout, trout, common barbel, European grayling, common vimba, common sneed; the list of fish-shaped contains a lampern. Atlantic salmon and bulltrout relate to migratory kinds of fish. Their living in Belarus is possible only in the pool of Viliya River. Since the given river is a unique waterway in the country which has open (not partitioned by dams) outlet to the sea, in this case, to the Baltic Sea.

A series of maps on which the ways of migration, spawning and fattening of salmon fishes have been noted, as well as the parts of the rivers where there are basic places of living of other kinds of fish being under protection.

The expected scenarios of possible changes of populations of rare species of fish in case of construction and operation of the Nuclear Power Plant are represented. Adverse situations of strengthening of press of fishers in case of growth of pollution of Viliya River with inflows at a stage of construction of the Nuclear Power Plant have been considered, as well as strengthening of press of fishers along with water level decrease in the river at a stage of functioning of the Nuclear Power Plant. In both cases probable reduction of a number and distribution area of «Red Book» kinds of fish has been predicted.

Adverse influence on the kinds of fish being under protection in case of design accidents at the Nuclear Power Plant with emission of radioactive substances is not expected.

For prevention of negative influences on the kinds of fish under protection the following measures and actions have been offered:

- Organization of educational work among the population;
- Ensuring maintaining of a water level in Viliya River and its inflows at a level of annual average supervision (by months). At that the critical (least) water level in Viliya River during the spring period should amount to at least 150 cm over mark «0» of hydrometeorological post of Mikhalishki. Within a year Viliya River should have the following dynamics of filling: 55 % of a flow during the spring period, 37 % of a flow during the summer-autumn period and 18 % during the winter period. It will ensure favourable conditions for spawning of fish and fattening of their fry.
- Around water intake it is necessary to provide for special fish-protecting structures preventing destruction of fish and its fry;
- For minimization of a damage from potential cumulative effect from local sources of pollution to provide for measures and actions for prevention of municipal, industrial and agricultural discharges and maintaining of natural chemism of water in a reservoir of Viliya River;
- Creation of water nursery on artificial reproduction of bulltrout and salmon, as well as other kinds of marketable fish. This will allow not only to compensate a damage from adverse factors of influence on the fish population and to preserve fish resources of the given region, but will give the right to receive quotas on catch of salmon kinds of fish (bulltrout, salmon) in the Baltic Sea;
- Ensuring of the conditions of calling of the manufacturers of salmon kinds of fish (salmon, bulltrout, trout) at the spawning rivers (liquidation of beaver colonies and their dams in the given waterways;
- Ensuring of regular monitoring of the state of population of rare endangered kinds of fish;
- Organization of field supervision of execution of the requirements on designing, planning and implementation of the above-mentioned requirements;
- Organization of additional hydrochemical monitoring of Viliya River and its inflows.

**Question 17:** EIA DOES NOT TOUCH THE THEME OF INFLUENCE OF POSSIBLE CONSTRUCTION AND OPERATION OF THE NUCLEAR POWER PLANT ON THE HISTORICAL AND CULTURAL HERITAGE AND THE CULTURAL LANDSCAPE. EIA DID NOT MENTION ALSO POSSIBLE INFLUENCE OF CONSTRUCTION AND EXPLOITATION OF THE NUCLEAR POWER PLANT ON THE ARCHAEOLOGICAL HERITAGE.

**RESPONSE:** The list of the historical and cultural values of the Ostrovetsky region of the Grodnenskaya oblast is represented in Table P.44.

**Table P.44 - Historical and Cultural Values of the Ostrovetsky Region**

<table>
<thead>
<tr>
<th>Name of the values</th>
<th>Date of origin</th>
<th>Location of the values</th>
<th>Digital designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Struve Geodesic Arc: «Konrady» Station</td>
<td>XIX century</td>
<td>Ostrovetsky region, 2,8 km to the North-West from Kandraty village</td>
<td>1</td>
</tr>
<tr>
<td>Site of Mesolithic period</td>
<td>7-6 thousand BC</td>
<td>д.Акартели, 0,5 км на юго-восток от деревни</td>
<td>2</td>
</tr>
<tr>
<td>Kostel of Holy Cross Ascention</td>
<td>Year 1760</td>
<td>Village of Bystritsa</td>
<td>3</td>
</tr>
<tr>
<td>Barrow burial ground of the period of the early Middle Ages</td>
<td>End of the 1-st thousand years BC</td>
<td>Village of Budrany, 0,7 km to the South-West from the village</td>
<td>4</td>
</tr>
<tr>
<td>Architectural complex of the centre of village of Vornyany</td>
<td>Year 1770, XVIII-XIX century</td>
<td>Village of Vornyany</td>
<td>5</td>
</tr>
<tr>
<td>Kostel of St. George</td>
<td>Middle of XVIII century</td>
<td>Village of Vorona</td>
<td>6</td>
</tr>
<tr>
<td>Ancient settlement</td>
<td>XI-XIII century</td>
<td>Village of Gury, 2 km to the East from the village</td>
<td>7</td>
</tr>
<tr>
<td>Ancient settlement</td>
<td>XI-XIII century</td>
<td>Village of Ignatovo (Ignatsovo), 1,5 km to the West from the village</td>
<td>8</td>
</tr>
<tr>
<td>Ancient settlement</td>
<td>XI-XIII century</td>
<td>Village of Kotonyaty (Korenyaty), 1,8 km to the North-West from the village</td>
<td>9</td>
</tr>
<tr>
<td>Barrow burial ground</td>
<td>1-2 thousand AD.</td>
<td>Village of Katsenovichi, 1,5 km to the North-West from the village</td>
<td>10</td>
</tr>
<tr>
<td>Kostel</td>
<td>Year 1900</td>
<td>Village of Kemelishki</td>
<td>11</td>
</tr>
<tr>
<td>Barrow burial ground</td>
<td>End of the 1-st thousand years AD</td>
<td>Village of Malye Sviryanki, 1,1 km to the North-East from the village</td>
<td>12</td>
</tr>
<tr>
<td>Name of the values</td>
<td>Date of origin</td>
<td>Location of the values</td>
<td>Digital designation</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>---------------------------------</td>
<td>------------------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Barrow burial ground</td>
<td>End of the 1-st thousand years AD</td>
<td>Village of Motski (Matski), 1,5 km to the North from the village</td>
<td>13</td>
</tr>
<tr>
<td>Kostel of St. Michael</td>
<td>XVII century</td>
<td>Village of Mikhalishki</td>
<td>14</td>
</tr>
<tr>
<td>Ancient settlement</td>
<td>XI-XIII century</td>
<td>Village of Nidzyany, 1 km to the South-East from the village</td>
<td>15</td>
</tr>
<tr>
<td>Barrow burial ground</td>
<td>End of 1-st thousand years AD</td>
<td>Village of Podkostyelok, 0,5 km to the South-East from the village</td>
<td>16</td>
</tr>
<tr>
<td>Trinity Church of Old Believers</td>
<td>XVIII-XIX century</td>
<td>Podol'sky Village Soviet, Tract of Strypishki</td>
<td></td>
</tr>
<tr>
<td>Barrow burial ground</td>
<td>Second half of the 1-st thou-sand years AD</td>
<td>Village of Polushki, 0,6 km to the South-East from the village</td>
<td></td>
</tr>
<tr>
<td>Barrow</td>
<td>1-st thousand years AD</td>
<td>Village of Perevozniki, 1 km to the West from the village</td>
<td>17</td>
</tr>
<tr>
<td>Barrow burial ground</td>
<td>Second half of the 1-st thou- sand years AD</td>
<td>Village of Pil'viny, 1,3 km to the South from the village</td>
<td>18</td>
</tr>
<tr>
<td>Barrow burial ground</td>
<td>1-st thousand years AD</td>
<td>Village of Savishki, 1,2 km to the South from the village</td>
<td>19</td>
</tr>
<tr>
<td>Ancient settlement</td>
<td>XI-XIII century</td>
<td>Village of Soroch'e, 0,5 km to the West from the village</td>
<td>20</td>
</tr>
<tr>
<td>Barrow of the period of Iron Age</td>
<td>V-VI century</td>
<td>Village of Andreyevtsy, on the right bank of Viliya River</td>
<td>21</td>
</tr>
<tr>
<td>Barrow</td>
<td>IV-VII century</td>
<td>Village of Vygolenenty, 1,5 km to the East from the village</td>
<td>22</td>
</tr>
<tr>
<td>Ancient settlement of the period of Iron Age</td>
<td>1 thousand years BC - V century AD</td>
<td>Village of Garony, 1,5 km to the North-West from the village</td>
<td></td>
</tr>
<tr>
<td>Holy Trinity Kostel</td>
<td>Year 1612</td>
<td>Village of Zhodishki</td>
<td>23</td>
</tr>
<tr>
<td>Former country estate</td>
<td>XVII century</td>
<td>Village of Zhodishki</td>
<td>24</td>
</tr>
<tr>
<td>Watermill</td>
<td>Year 1871</td>
<td>Village of Zhodishki</td>
<td>25</td>
</tr>
<tr>
<td>Site of the Mesolithic period</td>
<td>7-6 thousand years BC</td>
<td>Village of Zaozyortsy, between the centre of the village and the North-East bank of Ryzhee Lake</td>
<td>26</td>
</tr>
</tbody>
</table>

The Drawing represents the scheme of the Ostrovetsky region with the monuments marked on it.
Историко-культурные ценности Островецкого района
Fig. P.22, P.23 – Схема Островецкого района с нанесенными на нее Памятниками

In the Drawing the scheme of 5 km zones round the Nuclear Power Plant site is presented. From the drawing it is well seen that the planned motorway passes approximately at a distance of 3 km from «the Architectural complex of the centre of village of Vornyany» and «Barrow burial ground» of the village of Katsenovich. At the same distance from the given cultural monuments the railway will also pass.

Let us notice also that situated in immediate proximity from the road Polotsk - Vilnius St. Michael's Kostel, village of Mikhaliushki, and St. George Kostel, village of Vorona, have been constructed in XVII and XVIII centuries, accordingly. At that time there were no highways since there were no motor transport, there was no such goods traffic as there was no such developed industry. Thus, moving of cargoes by automobile and railway transport in the course of construction and operation of the Nuclear Power Plant will not directly affect the state of cultural values of the region. Besides, this stage of construction of the Nuclear Power Plant to which all goods traffic relates, is short enough.

It is necessary to notice that the Nuclear Power Plants are the largest tax payers in the regions of their location. Putting into operation of the Belarusian Nuclear Power Plant will provide for additional possibilities of the region for keeping the cultural values in a proper order.

The thesis of the authors of «Critical Remarks.» about distortion of a landscape and destruction of many kinds on cultural values and monuments can be reduced to an absurdity and can prohibit any construction in any place since any new object will deform a landscape and to destroy the view on cultural values and monuments.