AGREED
Deputy Director
WANO-MC

_____ S.V. Vybornov
“___” _____ 2018

APPROVED
Deputy Director in NPP production and operations – Director of emergency preparedness and radiological protection department
JSC "Concern Rosenergoatom"

_____ V.E. Khlebtsevich
“___” _____ 2018

RCC REPORT
ON PARTICIPATION IN EMERGENCY EXERCISE AT BUSHEHR NPP

3 October 2018

Topic: EMERGENCY EXERCISE AT BUSHEHR NPP

Moscow 2018

TABLE OF CONTENT

AREVIATIONS

NPP	nuclear power plant
JSC «Consist-OS»	joint stock company "Consist – Telecoms operator"
WANO-MC	WANO Moscow Center
VVER	water-cooled water-moderated power reactor
VCC	video conference communication
VNIIAES	joint stock company "All-Russian scientific and research institute for NPP operations"
CC	crisis center
SPC "Taifun"	scientific and production company "Taifun"
NRC “Kurchatov Institute”	National Research Center “Kurchatov Institute”
OPAS	NPP emergency support group
OKB "Gidropress"	design bureau "Gidropress"
EE	emergency exercise
PC	personal computer
RCC	regional crisis center
SCC Rosatom	FGUP "Situational and crisis center of Rosatom"
CC&OPAS FG	functional group ensuring CC and OPAS functioning
RCC FG	functional group ensuring RCC functioning
TSC	technical support center
UT	utility (operator), nuclear power plants

Introduction

Pursuant to schedule of the WANO Moscow Centre Regional Crisis Center (hereinafter RCC) for 2018 the emergency exercise with Bushehr NPP (Iran) on subject: "Emergency Exercise at Bushehr NPP (Iran)" took place on the 3rd October 2018 from 9:00 till 13:00 (Moscow time).

The main EE objective was to practice Regulations on functioning and Regulations on information exchange between participants of the WANO-MC Regional Crisis Center while responding to a simulated accident at Bushehr NPP (Iran).

The RCC EE supervisor – V.A. Golubkin, the chief technologist of the CC and OPAS functioning unit of the Emergency preparedness and radiation protection department.

Objectives of the EE were:

- RCC – Bushehr NPP communication channels (phone, fax, e-mail) test in the frames of response to a simulated accident at Bushehr NPP;
- evaluation of Bushehr NPP personnel readiness and skills in terms of ability to send and transfer RCC formats;
- to practice provision of expert/advisory and logistical support to Bushehr NPP.

The simulated accident at Bushehr NPP occurs at unexpected moment of time.

Emergency exercise participants

JSC "Concern Rosenergoatom" (OPAS group), Technological branch JSC "Concern Rosenergoatom", TSCs (JSC VNIIAES, SPC "Taifun", NRC "Kurchatov Institute", OKB "Gidropress"), technical support group JSC "Consist-OS" took part in the emergency exercise from Russian side.

Bushehr NPP (Iran), Fortum Corporation (Loviisa NPP (Finland), Slovenske Elektrarne (Bohunice NPP, Mochovce NPP (Slovak Republic), CEZ (Dukovany NPP, Temelin NPP (Czech Republic), JNPC (Tianwan NPP (China), NNEGC "Energoatom" (Ukraine), Kozloduy NPP (Bulgaria), Armenian NPP (Armenia), Belorussian NPP (Belorussia), Paks NPP (Hungary) took part in the emergency drill from the side of foreign companies.

World Association of Nuclear Operators, Moscow Centre, took part in the emergency drill as an international organization.

1 Results analysis of the emergency exercise

1.1 In course of the emergency exercise the information exchange procedures had been practiced between the RCC and RCC member utilities/NPPs in accordance with the Regulations

on information exchange between the participants of the WANO-MC Regional Crisis Center (hereafter – the Regulations on information exchange).

1.2 E-mail have been used as the main communication channel in frames of the exercise; in addition, all messages on the exercise shall be duplicated at the ftp-server of the Crisis Center. Videoconferencing, e-mail and phone were used for communication with the TSCs (NRC KI, OKB "Gidropress" and RPA "Typhoon").

1.3 During the exercise, the RCC received and transferred overall amount of 24 messages on simulated accident occurrence and development at Bushehr NPP. The chronological consequence of information exchange is provided in tables 1.1 and 1.2.

Table 1.1 – Chronological sequence of information received by RCC from emergency exercise participants (Incoming messages)

Msg. No	**Sender**	**Data transmission channel**	**Message**	**Sending time (MOW)**
1	Bushehr NPP	e-mail	RCC-2 format Information on safety significant events at NPP	09:10
2	TSC SPC "Taifun"	e-mail	Meteorological situation at the Bushehr NPP location	09:53
3	TSC SPC "Taifun"	e-mail	Assessment of possible transboundary transport of radioactive cloud in case of a radiation accident	10:13
4	Bushehr NPP	e-mail	RCC-3 format Information on accident within the site of NPP	10:25
5	TSC VNIIAES	e-mail	Evaluation of release source parameters	11:01
6	Bushehr NPP	e-mail	RCC-3a format Data on accident evolution within plant site/general accident	11:10
7	Bushehr NPP	e-mail	Operational break announcement	11:18
8	TSC VNIIAES	e-mail/fax/ FTP	Radiological situation assessment at the plant location	11:31
9	TSC VNIIAES	e-mail	Recommendations on public protection at the Bushehr NPP location	11:47
10	TSC SPC "Taifun"	e-mail	Radiological situation assessment at the plant location	11:47
11	TSC SPC "Taifun"	e-mail	Recommendations on public protection at the Bushehr NPP location	11:53
12		e-mail	Recommendations on the transfer of the facility to a normal state	13:38
13	Bushehr NPP	e-mail	End of the exercise	14:30
Messages received in total			13	

Table 1.2 - Chronological sequence of information sent from RCC to emergency exercise participants (Outgoing messages)

Reg. No	Addressee	Data transmission channel	Message	Sending time (MOW)
1	TSC	e-mail	Exercise start	9:10
2	TSC, OO/NPP – RCC members	e-mail	Form RCC-2 Information on safety-significant events at NPP	9:37
3	OO/NPP – RCC members	e-mail	Meteorological situation at the Bushehr NPP location	09:53
4	OO/NPP – RCC members	e-mail	Assessment of possible transboundary transport of radioactive cloud in case of a radiation accident	10:13
5	TSC, OO/NPP – RCC members	e-mail	RCC-3-VVER format Message on accident within the NPP site	10:40
6	TSC	e-mail	"High alert" mode announcement	10:53
7	TSC, OO/NPP – RCC members	e-mail	Evaluation of release source parameters	11:01
8	TSC, OO/NPP – RCC members	e-mail	RCC-3a-VVER format Data on accident evolution within plant site/general accident	11:20
9	OO/NPP – RCC members	e-mail	Recommendations on public protection at the Bushehr NPP location	11:40
10	OO/NPP – RCC members	e-mail	Radiological situation assessment at the plant location	11:41
11	TSC, OO/NPP – RCC members	e-mail	End of the exercise	14:33
Messages forwarded in total			11	

Having analyzed the tables 1.1 and 1.2 it should be concluded that the information submission timeframes in accordance with the Regulations on information exchange have been mainly observed. The EE allowed revealing certain deficiencies concerning filling out the RCC formats:

- Outgoing RCC messages No 7 and 9, which informed on evaluation of radioactive emission source and on measures to protect personnel and population, respectively, had no registration number, no date and sending time, no signature of the EE head. Besides, the named message was sent to OO/NPP in Russian.
- Some of the OO/NPPs – RCC Members failed to confirm messages receipt as required to during the EE information exchange.

2 Evaluation of the emergency exercise

The results of comprehensive evaluation show good convergence of the EE assessment conducted by RCC and Bushehr NPP.

Attachment 1 provides comprehensive assessment of the emergency exercise performed at Bushehr NPP on 3.10.2018 г.

Expert/advisory support to the ETC Concern Rosenergoatom.

In order to prepare recommendations on bringing the facility to a normal state, as well as recommendations on possible radiation consequences and measures to protect personnel and the public, the Rosenergoatom TSCs were brought together.

TSC SPC "Taifun" performed an assessment of meteorological situation at the plant location and possibility of a transboundary transport of radioactive cloud in case of a radiation accident (Attachment 2.1, 2.2).

According to the available data on the reactor unit state, taking into account the meteorological conditions at plant location, TSC JSC VNIIAES performed evaluation of release source parameters, prepared radiological situation assessment and recommendations on public protection at the plant location (Appendix 2.3). TSC OKB "GIDROPRESS" prepared recommendations on the transfer of the facility to a normal state (Appendix 2.4).

The result of TSC activities were prepared and forwarded to the Bushehr NPP in the form of respective recommendations.

Conclusion

During the emergency exercise the information exchange practices were performed according to the Regulations of information exchange between participants of the WANO-MC Regional Crisis Center. In course of the exercise RCC received 13 messages on simulated accident occurrence and development at Bushehr NPP (including TSC recommendations) that were processed and re-transmitted to RCC member utilities/NPPs.

Positive elements of the emergency exercise to be mentioned are:

- the information submission timeframes in accordance with the Regulations on information exchange have been mainly observed;
- a process of expert/advisory support to the affected plant was successfully drilled;
- the results of a comprehensive two-sided evaluation showed good convergence.

Certain deficiencies have been noted regarding correctness of filling out of RCC formats, it is recommended to conduct respective briefing.

The main objective of the EE with Bushehr NPP, which was conducted on 3 October 2018 was achieved. The RCC shift on duty and the responsible for interaction with RCC from side of Bushehr NPP practiced actions in accordance with the Regulations on information exchange between the RCC members.

Attachment 1 – Evaluation of emergency exercise at Bushehr NPP on 03.10.2018

No.	Evaluation criteria	RCC evaluation	Bushehr NPP evaluation	Summative evaluation	Remarks
1	Adherence to the timeframes of messages sending to the RCC according to the Information Exchange Regulations.	SAT	SAT	SAT	The information submission timeframes in accordance with the Regulations on information exchange have been mainly observed.
2	Correctness of forms filling out and sequence of information exchange	SAT	SAT	SAT	The sequence of format filling out met the Regulations on information exchange.
3	Number of received by RCC and forwarded forms	SAT	SAT	SAT	Number of messages sent corresponds with the planned massages number.
4	Sufficiency of data to understand situation at the plant.	SAT	SAT	SAT	Technical information provided by Bushehr NPP was sufficient to understand the situation.
5	Correctness of the initiating event description in accordance with the EE scenario.	SAT	SAT	SAT	A technological scenario was not provided by Bushehr NPP
6	Use of proper forms	SAT	SAT	SAT	Up-to-date forms of information exchange were used
7	Organization of interaction within emergency drills and exercises (audio/video conference communication).	NOF	SAT	NOF	Unstable functioning of internet channel from BNPP side was observed for approximate an hour
8	Availability of backup communication channels	SAT	SAT	SAT	Backup communication channels were available for use
9	Provision of expert / advisory support to the utility / NPP.	SAT	SAT	SAT	Bushehr NPP received expert/advisory support from RCC
10	List of the forces and means engaged into the emergency exercise.	**NOT**	NOF	**NOT**	Bushehr NPP had not requested technical support from the RCC
11	Acknowledge receipts by the RCC	**SAT**	**SAT**	**SAT**	RCC was sending acknowledge receipts to Bushehr NPP

***SCORE:**

SAT: Satisfactory fulfillment of the criterion. Minor deficiencies could exist that do not impact the overall fulfillment of the criterion.

NOF: Criterion is not fully fulfilled. Efforts are needed to resolve deficiencies.

UNSAT: Unsatisfactory fulfillment of the criterion. Performance criterion is not fulfilled.

NOT: Not applicable to the RCC member (depends on the participation level).

Противоаварийная тренировка !!! EXERCISE !!!

Исх №1

Форма 3

Метеорологические условия

ЦТП НПО «Тайфун»
Наименование ЦТП, представляющего данную информацию

АЭС Бушер (Иран)
Место проведения противоаварийной тренировки

Таблица 1. **Метеорологические условия в районе размещения АЭС**

Направление ветра, град		**350°-30°**
Скорость ветра W_f на высоте флюгера z_f = 10 м, м/с		**1-2м/с**
Поворот направления ветра $\Delta\varphi$ (град) в слое от z_f до h	h=50 м	**0°**
	h=100 м	**-5°**
Состояние атмосферы (по классификации Пасквилла)		**B**
Осадки	Интенсивность, мм/час	-
	Тип осадков	-
Параметр шероховатости z_0 подстилающей поверхности, м		**0.1**

На момент 09 ч. МСКВ 03.10.2018

Руководитель экспертной группы А.И. Бурков

Исполнитель (фамилия, подпись) Л.М. Хачатурова

Время и дата отправки формы 09:50 03 октября 2018 г.

Противоаварийная тренировка !!! EXERCISE !!!

Противоаварийная тренировка !!! EXERCISE !!!

Форма 6 (на 2-х страницах) **стр. 1 из 2**

исх. №2

Оценка возможности трансграничного переноса радиоактивного облака в случае возникновения радиационной аварии на АЭС Бушер (Иран)

ЦТП НПО «Тайфун»

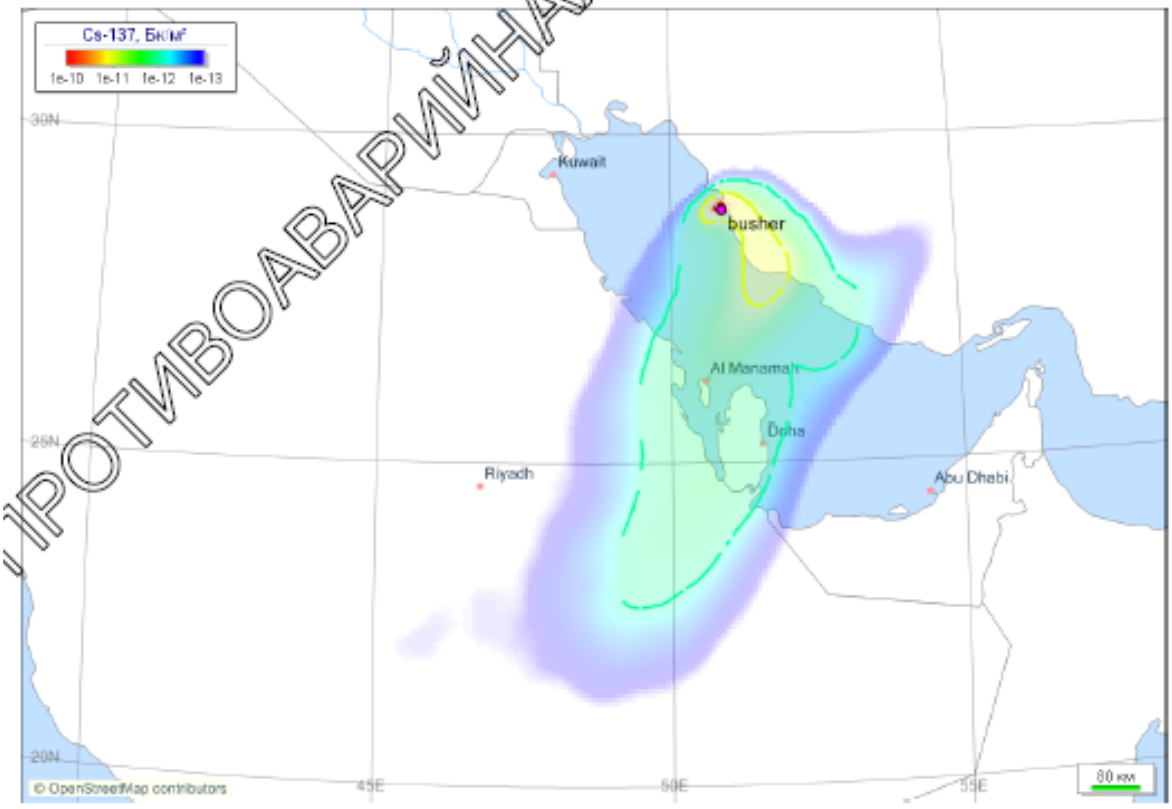
Наименование ЦТП, представляющего данную информацию

Вводная №

Запрос или вводная, по которой представляется данная информация

1. Время начала выброса: "03" октября 2018 г. в 09 МСК
2. Величина выброса: Cs-137, 1 Бк
3. Длительность выброса: 6 часов
4. Длительность прогнозируемого периода от начала аварии: 72 часа

5. Интегральная плотность выпадения Cs-137 за прогнозируемый период



Противоаварийная тренировка !!! EXERCISE !!!

ЦТП НПО «Тайфун»

Противоаварийная тренировка !!! EXERCISE !!!

Форма 6 (на 2-х страницах) **стр. 2 из 2**

исх. №2

Результаты расчета показывают, что ожидается трансграничный перенос на территорию государств:

Страна	День, месяц, год, время (МСК) достижения передним фронтом радиоактивного облака границы государства
Иран	03.10.2018 09 часов
Саудовская Аравия	03.10.2018 21 час
Бахрейн	03.10.2018 23 часа
Катар	04.10.2018 00 часов
Объединенные Арабские Эмираты	04.10.2018 12 часов

Субъекты Российской Федерации радиоактивному загрязнению не подвергнутся.

Руководитель экспертной группы А.И. Бурков

Исполнитель: И.В. Стогова

Время и дата отправки формы (по Москве) 10:08 “ 03 ” октября 2018 г.

Противоаварийная тренировка !!! EXERCISE !!!

ЦТП НПО «Тайфун»

Тренировка!!! Тренировка!!! Тренировка!!! Тренировка!!!

РОСЭНЕРГОАТОМ
ЭЛЕКТРОЭНЕРГЕТИЧЕСКИЙ ДИВИЗИОН РОСАТОМА

Кому: ЭГ по РБ и МЗ
От: **ЦТП ВНИИАЭС**
Эл. почта: _____ Телефон: _____

Рег. № 2
от «3» 10 2018 г.
Время: 11 : 31
Страница 1 из 2.

Форма 4

Результат оценки радиационной обстановки на местности

ЦТП ВНИИАЭС
Наименование ЦТП, представляющего данную информацию

АЭС Бушер
Место проведения противоаварийной тренировки

Метеоусловия

Ветер Направление 0° **Осадки** **Категория устойчивости** B
Скорость 2 м/с интенсивность мм/ч
тип осадков

Характеристика территории в направлении ветра
Параметр шероховатости (z_o) 0,1

Таблица 1. **Прогнозируемая доза за первые 10 суток после аварии, мГр**

Расстояние от АЭС, км	*Доза на ЩЖ*		*Доза на все тело*	
	взрослые	дети	С внутр. обл.	Без внутр. обл.
1	5,9E+1	2,3E+2	4,7E+0	1,7E+0
2	1,8E+1	4,1E+1	1,5E+0	5,3E-1
3	9,2E+0	2,0E+1	7,2E-1	2,6E-1
4	5,7E+0	1,3E+1	4,4E-1	1,6E-1
5	3,9E+0	8,7E+0	3,1E-1	1,1E-1
6	2,9E+0	6,5E+0	2,3E-1	8,2E-2
7	2,3E+0	5,1E+0	1,8E-1	6,4E-2
8	1,9E+0	4,2E+0	1,5E-1	5,2E-2
10	1,3E+0	3,0E+0	1,0E-1	3,7E-2
12	1,0E+0	2,3E+0	8,0E-2	2,8E-2
14	8,3E-1	1,8E+0	6,4E-2	2,2E-2
16	6,9E-1	1,5E+0	5,3E-2	1,8E-2
20	5,2E-1	1,1E+0	3,9E-2	1,3E-2
25	3,9E-1	8,6E-1	2,9E-2	9,7E-3
30	3,1E-1	6,8E-1	2,3E-2	7,6E-3
40	2,2E-1	4,8E-1	1,6E-2	5,2E-3
50	1,7E-1	3,7E-1	1,2E-2	3,9E-3

Тренировка!!! Тренировка!!! Тренировка!!! Тренировка!!!

Исполнитель (фамилия, подпись) А.А. Орехов
Время и дата отправки формы (по Москве) " 03 " октября 2018 г.

Тренировка!!! Тренировка!!! Тренировка!!! Тренировка!!!

РОСЭНЕРГОАТОМ
ЭЛЕКТРОЭНЕРГЕТИЧЕСКИЙ ДИВИЗИОН РОСАТОМА

Таблица 1. **Расстояния, на которых следует применить экстренные меры защиты взрослых и детей(по уровню А НРБ-99/2009), км**

Меры защиты	*Взрослые*	*Дети*
Укрытие	1,8	
Йодная профилактика	0	1,2
Эвакуация	0	

Таблица 1. **Расстояния, на которых следует применить экстренные меры защиты взрослых и детей (по уровню Б НРБ-99/2009), км**

Меры защиты	*Взрослые*	*Дети*
Укрытие	0	
Йодная профилактика	0	0
Эвакуация	0	

Исполнитель (фамилия, подпись)_____ А.А. Орехов
Время и дата отправки формы (по Москве)_____ “ 03 ” октября 2018 г.

ТРЕНИРОВКА!!!ТРЕНИРОВКА!!! ТРЕНИРОВКА!!!

ОКБ «ГИДРОПРЕСС» | АТОМЭНЕРГОМАШ ГРУППА КОМПАНИЙ РОСАТОМА

	Кризисный центр	
Кому:	АО «Концерн Росэнергоатом»	Рег. № _1__
От:	АО ОКБ «ГИДРОПРЕСС»	от «_03_»_10_2018 г.
Эл. почта:	Телефон:	Время: __11__:__00_
cts@grpress.podolsk.ru	(4967)-69-98-29	Страница 1 из 1

По тренировке на АЭС «Бушер»
03.10.2018 г.

В условиях ложного открытия и незакрытия ИПУ ПГ-4, срабатывания АЗ, отключения ГЦН-4 и далее всех ГЦН при течи из первого контура во второй ПГ-4, а также изоляции ПГ-4 по пару от парового коллектора рекомендуется:

1) Контролировать автоматику в части аварийного расхолаживания 60 градусов С/час сбросом пара через БРУ-А 3х ПГ-1,2,3
2) Переход по инструкции на контур TQ 12 аварийного отвода тепла активной зоны от бака-приямка (с рециркуляцией или без)
3) Контролировать уровень в реакторе,(не допуская оголение топлива) и температуру на выходе из ТВС менее 150 градусов С
4) Действовать по РУЗа
5) Обеспечивать запасы борной воды в баках

Эксперты ОКБ «Гидропресс»
А.В.Воронков
В.В.Щеколдин

03.10.18

Тренировка!!! Тренировка!!! Тренировка!!! Тренировка!!!

AGREEMENT SHEET

On behalf of the JSC "Concern Rosenergoatom"

Deputy Director of the Emergency preparedness and radiation protection department - Chief of the CC and OPAS functioning unit	A.P. Markov
Chief technologist of the CC and OPAS functioning unit of the Emergency preparedness and radiation protection department	V.A. Golubkin

On behalf of the WANO-MC

WANO-MC Advisor	S.A. Loktionov

On behalf of the VNIIAES

Head of radiological safety and emergency response department	A.D. Kosov