

**PROBLEMS OF DISMANTLING  
OF DAMAGED NPS AT THE  
FAR EAST OF RUSSIA**

**TABLE 1. DAMAGED NPS OF THE PASIFIC NAVY**

<b>DAMAGED NPS</b>	<b>CAUSE OF ACCIDENT</b>	<b>EFFECTS OF ACCIDENT</b>	<b>PLANNED ACTIVITY</b>
<b>NPS. № 175 PROJECT 675</b>	<b>SCR OF THE PORTSIDE REACTOR DURING REPAIRS</b>	<b>FAILURE OF INTERNAL STRUCTURES AND EQUIPMENT ENCLOSURES, ESCAPE OF RADIOACTIVE PRODUCTS TO BEVOND THE REACTOR COMPARTMENT. THE RADIATION SITUATION WITHIN THE RC IS EXTRIMELY HAZARDOUS.</b>	<b>CREATION OF THREE- COMPARTMENT UNIT WITH SNF NOT UNLOADED FROM THE STARBOARD REACTOR, ISOLATION OF THE RB IN THE RAZBOINIK-BAY ON- SHORE SHELTER</b>
<b>NPS № 610 PROJECT 671</b>	<b>UNCOVERABLE LOSS OF THE PS REACTOR COOLANT DURING THE REACTOR COOL DOWN</b>	<b>LOSS OF THE FA LEACTIGHTNESS. ESCAPE OF RADIOACTIVE PRODUCTS INTO RS ROOMS. THE RADIATION SITUATION WITHIN THE RC IS EXTRIMELY HAZARDOUS.</b>	<b>CREATION OF THREE- COMPARTMENT UNIT WITH SNF NOT UNLOADED FROM THE STARBOARD REACTOR, ISOLATION OF THE RB IN THE RAZBOINIK-BAY ON- SHORE SHELTER</b>

**ОБЕСПЕЧЕНИЕ НЕПОТОПЛЯЕМОСТИ АВАРИЙНЫХ АПЛ В ПРОЦЕССЕ  
ХРАНЕНИЯ НА ПЛАВУ**

**TO ENSURE SAFE STORAGE AFLOAT, THE DAMAGED NPS 175 AND 610 WERE SUBJECTED TO DOCK EXAMINATION AND REPAIR IN 1991 AND 1996 RESPECTIVELY.**

**AT PRESENT TIME UNSINCABILITY FOR BOTH NPS IS ACHIEVED THROUGH THE USE OF ADDITIONAL NONSTANDARD MEANS:**

- AT EACH NPS INSTALLED PONTOONS;**
- THE SISTEM OF SUPPLAY AIR FROM ON-SHORE SOURCES INSTALLED.**

**IT SHOULD BE CONSIDERED THAT HAZARDS OF RADIOECOLOGICAL INCIDENTS CONTINUE TO EXIST IN STORAGE OF THE DAMAGED NPS AND THEIR POTENTIALITY IS IMPLACABLY GROWING BECAUSE OF METALL CORROSION.**

**SO THE INVIRONMENTAL SAFETY PROBLEM WITH RESPECT TO THE NPS 175 AND 610 SHOULD BE SOLVED IN THE NEAR FUTURE. IT CAN BE ACHIVED THROUGH THE PLACEMENT OF NPS ON A HARD FOUNDATION.**

**OBTAINING INPUT DATA AND DEVELOPING REQUIREMENTS FOR THE TECNOLOGY OF DAMAGED NPS REMEDIATION REQUIRE DETALED INFORMATION ON THE REAL RADIATION SITUATION INSIDE AND OUTSIDE THE NPS.**

## **RADIATION SITUATION AT THE NPS 175 AND 610**

**THE PRELIMINARY DATA ON THE RADIATION SITUATION AT THE DAMAGED NPS WERE OBTAINED DURING EXAMINATION BY FSUE FES ZVEZDA, FSUE NIKIET, FSUE OKBM IN 1991 - 2004.**

**THE RESULTS OF THE RADIATION SURVEYS SHOW THAT THE RADIATION LEVELS IN THE REACTOR COMPARTMENTS ARE DECREASING BUT STILL REMAIN EXTREMELY HAZARDOUS SO NO OPERATIONS TO PREPAIR AND SNF UNLOADING FROM THE REACTORS OF THESE NPS CAN BE PERFORMED IN NEAR TERM.**

**ТАК, НАПРИМЕР, В РЕАКТОРНОЙ ВЫГОРОДКЕ АПЛ ЗАВ. № 175 МОЩНОСТЬ ДОЗЫ ГАММА-ИЗЛУЧЕНИЯ ЗА 8 ЛЕТ СНИЗИЛАСЬ С 250 МЗВ/Ч ДО 180 МЗВ/Ч., ЧТО ОБЪЯСНЯЕТСЯ РАСПАДОМ  $\text{Co}^{60}$ .**

**ДЛЯ АПЛ ЗАВ. № 610, ГДЕ РАДИАЦИОННАЯ ОБСТАНОВКА ОПРЕДЕЛЯЕТСЯ НАЛИЧИЕМ В ОСНОВНОМ РАДИОНУКЛИДА  $\text{Cs}^{137}$ , ТАКОГО СНИЖЕНИЯ УРОВНЕЙ ИЗЛУЧЕНИЯ ОЖИДАТЬ НЕ СЛЕДУЕТ.**

**В РЕЗУЛЬТАТЕ РАДИАЦИОННЫХ ОБСЛЕДОВАНИЙ ОКОНЕЧНОСТЕЙ АВАРИЙНЫХ АПЛ БЫЛО УСТАНОВЛЕНО, ЧТО ПОВЫШЕННЫЕ ЗНАЧЕНИЯ МОЩНОСТИ ЭКСПОЗИЦИОННОЙ ДОЗЫ ГАММА-ИЗЛУЧЕНИЯ НАБЛЮДАЮТСЯ ТОЛЬКО В ОТСЕКАХ, СМЕЖНЫХ С РЕАКТОРНЫМ ОТСЕКОМ.**

**ПРИ ЭТОМ МАКСИМАЛЬНЫЕ УРОВНИ НАБЛЮДАЮТСЯ НА ПЕРЕБОРКАХ РЕАКТОРНОГО ОТСЕКА:**

**НА АПЛ ЗАВ. № 175 – ДО 0,38 мЗВ/Ч**

**НА АПЛ ЗАВ. № 610 – ДО 0,90 мЗВ/Ч.**

**ПРИ УДАЛЕНИИ ОТ ПЕРЕБОРКИ НА 2 М ЗНАЧЕНИЯ МОЩНОСТИ ДОЗЫ СНИЖАЮТСЯ В 20-30 РАЗ.**

**В ОСТАЛЬНЫХ ОТСЕКАХ ИМЕЮТСЯ ЛОКАЛЬНЫЕ ИСТОЧНИКИ ИЗЛУЧЕНИЯ, МОЩНОСТЬ ЭКСПОЗИЦИОННОЙ ДОЗЫ ОТ КОТОРЫХ СОСТАВЛЯЕТ 0,002 – 0,01 мЗВ/Ч.**

**НА ОСНОВАНИИ РЕЗУЛЬТАТОВ РАДИАЦИОННЫХ ОБСЛЕДОВАНИЙ СДЕЛАН ВЫВОД, ЧТО РАДИАЦИОННАЯ ОБСТАНОВКА К КОНЦЕВЫМ ОТСЕКАМ АПЛ ЗАВ. №№ 175 И 610 ПОЗВОЛЯЕТ ПРОВЕСТИ РАБОТЫ ПО ФОРМИРОВАНИЮ ТРЕХОТСЕЧНЫХ БЛОКОВ С СОБЛЮДЕНИЕМ ДЕЙСТВУЮЩИХ ТРЕБОВАНИЙ ПО РАДИАЦИОННОЙ БЕЗОПАСНОСТИ.**

## **DESIGN SOLUTIONS FOR REMEDIATION OF DAMAGED NPS**

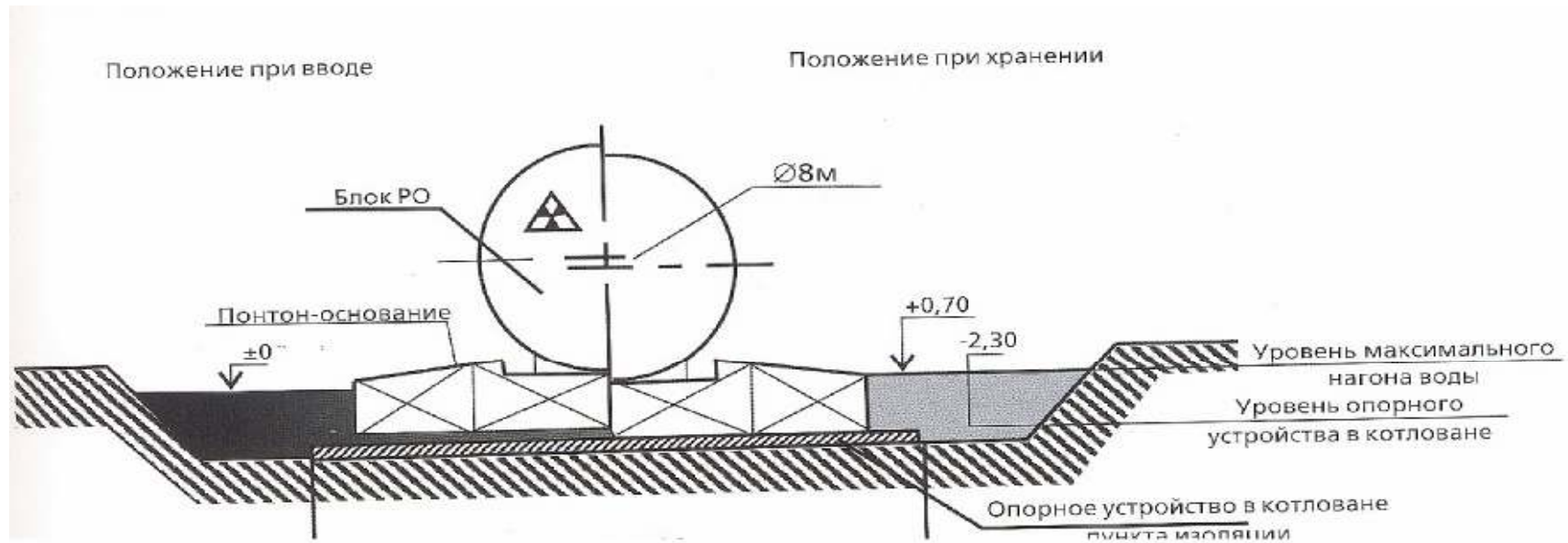
**THE OPTION USING A PONTOON FOUNDATION WAS SELECTED BY PROPOSAL OF FSUE RUBIN.**

**THIS IMPLEMENTATION REQUIRES TO:**

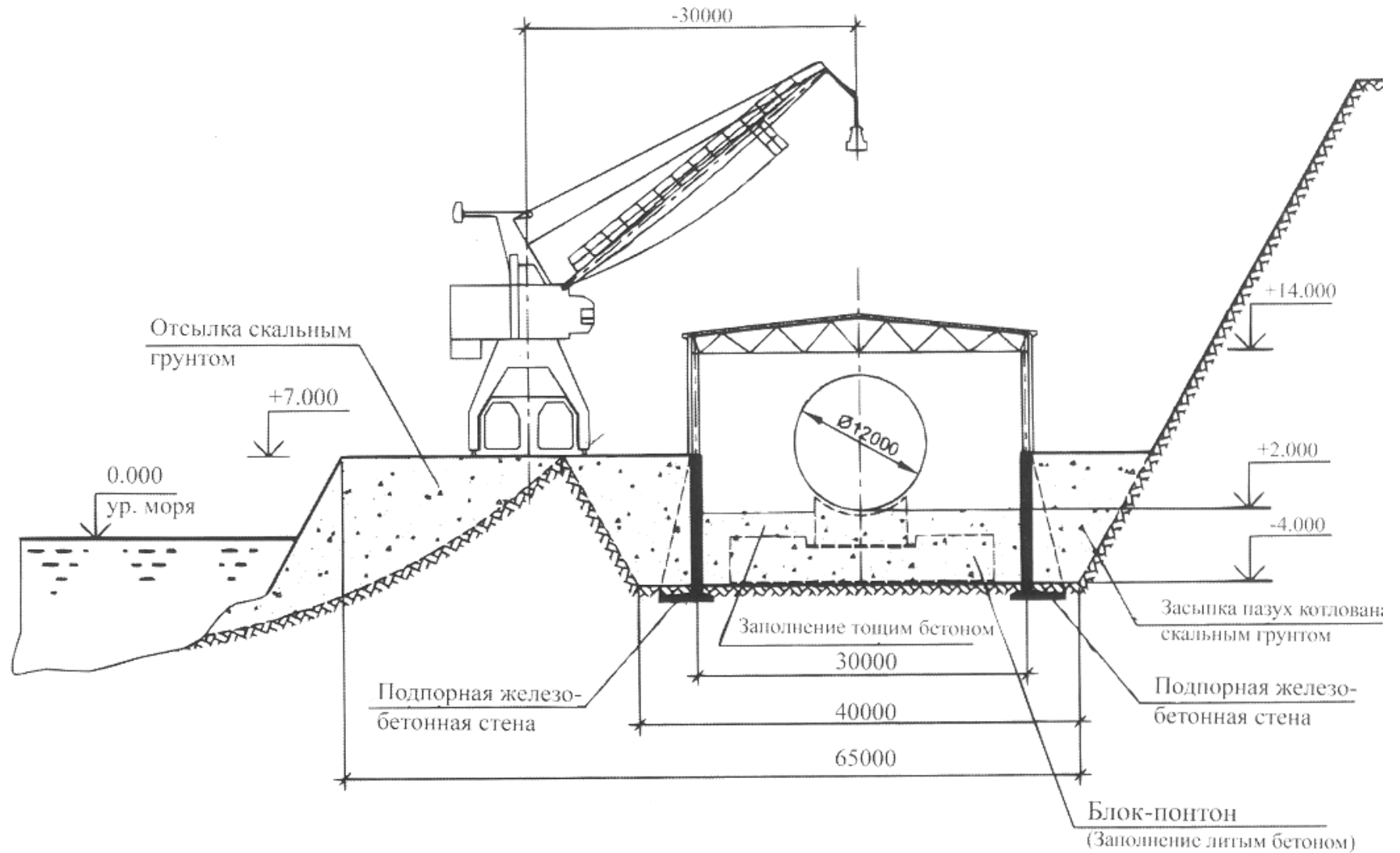
- CREATE THE PONTOON FOUNDATION TO FIT THE NPS PARAMETERS;**
- TRANSFER THE NPS TO THE FLOATING DOCK AND INSTALL IT ONTO THE PONTOON FOUNDATION;**
- CUT THE NPS TO CREATE THREE COMPARTMENT UNIT ON THE PONTOON FOUNDATION AND PREPAIR THE UNIT FOR LONG TERM STORAGE;**

- FLOAT OFF THE PONTOON FOUNDATION WITH THE REACTOR UNIT AFTER IT IS PREPARED AND TOW IT TO THE ON-SHORE SHELTER S WATER AREA;**
- EXCAVATE PIT WITH A DEPTH OF ABOUT 3,5 M ON THE ON-SHORE SITE AND BUILT THE SHELTER IN IT;**
- BUILD THE CHANNEL TO CONNECT THIS WATER AREA WITH THE REACTOR UNIT STORAGE SITE;**
- MOVE THE PONTOON FOUNDATION TROUGH THE CHANNEL AND IMMOBILIZE IT IN THE SHELTER;**
- CLOSE THE TRANSFER CHANNEL.**

# PONTOON FOUNDATION WITH THE REACTOR UNIT



# ON-SHORE SHELTER FOR THE DAMAGED NPS



## **CONCLUSION**

**THE SUPPORT FOR THE PROJECT TO REMEDIATE THE DAMAGED NPS ON THE PART OF INTERNATIONAL COMMUNITY CAN PROVIDE FOR MUCH FASTER SOLUTION OF THIS PRESSING PROBLEM.**

**THE OVERALL PROJECT TO CREATE THE SHELTER FOR THE DAMAGED NPS CAN INCORPORATE SEPARATE SUBPROJECTS:**

- CONSTRUCTION OF PONTOON FOUNDATIONS;**
- DEVELOPMENT OF WORKING DOCUMENTS AND CONSTRUCTION OF THE SHELTER PIT;**
- DEVELOPMENT OF WORKING DOCUMENTS AND CONSTRUCTION OF THE BUILDING FOR THE REACTOR UNIT NPS 175;**
- CONSTRUCTION OF THE BUILDING FOR THE REACTOR UNIT NPS 610.**

## **COST ESTIMATE OF THE PROJECT**

<b>STAGE OF WORK</b>	<b>COST, THOUSAND USD</b>
<b>CONSTRUCTION OF PONTOON FOUNDATIONS</b>	<b>8500</b>
<b>DEVELOPMENT OF WORKING DOCUMENTS AND CONSTRUCTION OF THE SHELTER PIT</b>	<b>14400</b>
<b>DEVELOPMENT OF WORKING DOCUMENTS AND CONSTRUCTION OF THE BUILDING FOR THE REACTOR UNIT NPS 175</b>	<b>25200</b>
<b>CONSTRUCTION OF THE BUILDING FOR THE REACTOR UNIT NPS 610</b>	<b>16000</b>