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EMERGENCY PREPAREDNESS AND RESPONSE (Chernobyl Experience)

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**It is appropriate to start with the question:
Was the country ready for an accident which took place on 26
April 1986 at Chernobyl NPP?**



Even now, more than 27 years after the accident, it is not possible to give either positive or negative answers – due to suddenness, unique nature (reactivity accidents!) and scale of the catastrophe hardly any country in the World was ready for such events. Fukushima accident confirm this fact.

For the first time ever the USSR faced the radiation accident of the global scale when it was necessary to undertake measures for protection of millions of people. All the previous radiation incidents (there were several in the USSR and in other countries) were of local nature.

Essential Faults in the Emergency Preparedness (1):

- Low efficiency of the radiation control system within the NPP site and territory of the country. Moreover, the radiation monitoring systems were not designed for such accident condition;
- There were both confusion with decoding of indices of dosimeter devices and under evaluation of the iodine danger. There were no clear methodology on evaluation and forecasting of evolution of the radiation situation. Medical and sanitary criteria for making the appropriate decisions were unclear or absent;
- The system of the Civil Defense turned to be not ready for the large scale radiation accident;
- Special emergency divisions of NPP established in accordance with the emergency regulations and plans duplicated the routine structures of the NPP and demonstrated incapacity to work. The things regulated by the emergency plans often hampered, led to mess in the notification system, formation of parallel, sometimes contradictory informational flows;

Essential Faults in the Emergency Preparedness (2):

- The issues of who should make and announce the decision of evacuation and who, based on what procedures, should perform the forecast assessments of the radiation conditions were not defined in procedures;
- Univocal criteria of decision making in the area of radiation protection of the population were absent (Under the emergency conditions, when the time for calculations and research is limited to maximum, it is difficult to provide for the necessary promptness in making the appropriate decisions. It must be absolutely clear who shall develop the conclusion about the level of radiation danger: NPP, local authorities, medical and sanitary bodies or the bodies are responsible for emergency response)

Essential Faults in the Emergency Preparedness (3):

- Absence of the radiation survey beyond the limits of the NPP observation area and clear objective forecast of development of the radiation situation resulted in the evacuation of the substantial number of the citizens of Pripyat town to the settlements the western path of radioactive cloud passed over;
- During the pre-Chernobyl period a lot was done for the purposes of emergency planning, but many actions were of chairborne nature, far from the life, and that led to significant problems under the complicated radiation conditions;
- During the first days after the accident the policy of secrecy was pursued of the fact of accident itself, and later limitation of ingress of the data related to the scale and consequences into the mass media. The falseness of such approach became apparent very quickly;

Essential Factors in Emergency

Principal problem and principal lesson – extremely low population knowledge of nuclear and radiation issues and faults in information provision to the population in the issues of NPPs and radiation safety. Lack of knowledge causes lack of trust. It requires many years and apply every effort to enhance society knowledge and decrease the fear of unknown

Significant influence on psychological conditions of inhabitants belong to medical doctors. It should be noted that the supreme devotion to the medical oath was demonstrated by the medical doctors of Pripyat town faced the first attack. They are in the same row with the operators and fire brigade members of Chernobyl NPP.

EMERGENCY MANAGEMENT

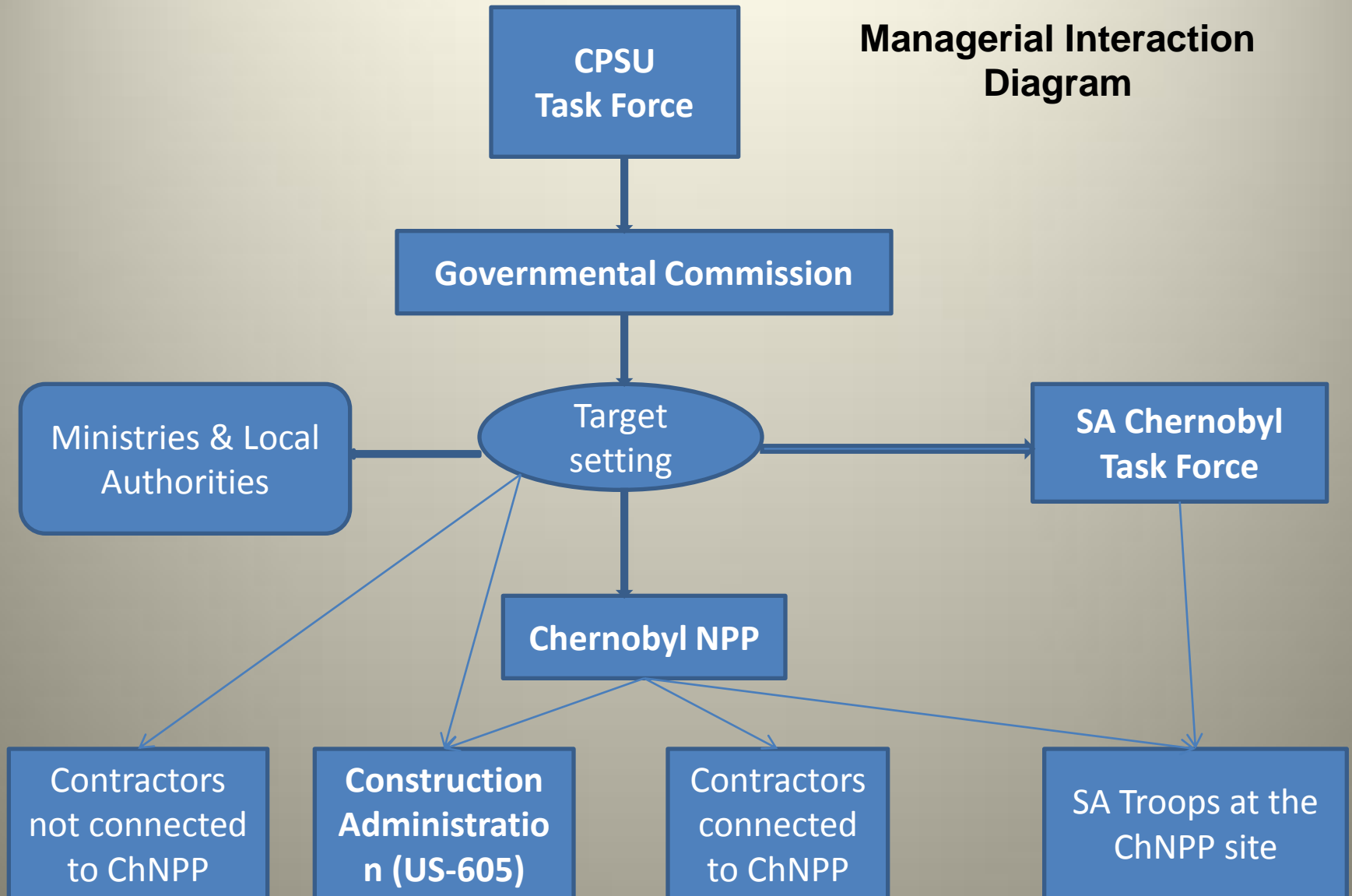
The effective system of accident management was established to allow focusing of the necessary financial, material, intellectual and human resources on the solution of the Chernobyl problems:

- The Governmental Commission (GC) on Chernobyl matters was established in the morning of April, 26, which in the evening of the same day met for the first time directly in Pripyat town, and at 2 a.m. of April, 27 it made the decision of the evacuation of the town;
- Upon perception of the scale of the accident and its consequences, on April, 28 the Task Force of Political Bureau of Central Committee of the Communist Party of the USSR (Task Force)) was established – a headquarters, the supreme political management authority in liquidation of the accident consequences;
- During couple of days the special managerial divisions in the all Ministries and Departments were established at the level of the USSR and all Republics. The representatives of all these divisions stayed directly in Chernobyl;

Response started. The main tasks of the works at the first stage included the protection of people's health, realization of the urgent measures to stabilize the situation directly on NPP site and at the adjacent areas.

During May 1986 all this activity was of active defense nature. More and more problems occurred requiring instant response.

Managerial Interaction Diagram



Task Force (1)

- reviewed the reports of the GC on the problems occurring and assistance required for their solution. Practically all actions and proposals of the GC underwent thorough analysis in the Task Force;
- considered the strategic aspects of such issues as:
 - life support of the population of the suffered areas, measures on compensation of the losses, about evacuation of the settlements, building of new facilities, medical treatment, and kids health improvement;
 - decontamination of the site and facilities of NPP, dust suppression, protection of the underground and surface water;
 - building of the Shelter Object, restoration of NPP, return it to the ranks of operated NPPs, conditions of labor of its personnel, solution of the personnel housing problems, including construction of the new town, etc.

It was mandatory for the top managers of Ministry of Health, Ministry of Medium Machine Building, Governmental Hydrometeorological Committee, General Headquarters of Ministry of Defense, Academy of Science of USSR, and Ministry of Energy to participate in these meetings.

Task Force (2)

Last meeting of the Task Force took place in January 1988 (it were 44 meetings of Task Force beginning April 28, 1986). The situation stabilized. The necessity of Task Force operation had gone. The management of the fully went over to the GC.

Task Force played one of decisive roles in overcoming of the Chernobyl consequences and successively played the role of General Staff in the fight with the accident, having concentrated all the resources of the country on the solution of this task.

H. Blix, IAEA Director General at that time, noted *though he was not an adherent of the command and administration system, exactly this system managed to promptly and efficiently solve the tasks related to the liquidation of the consequences of the accident. Not many countries of democratic doctrine could cope with them in such a successful manner.*

Governmental Commission (1)

- The organization of the activities of multiple divisions of various ministries and departments directly on Chernobyl NPP site and in the suffered regions is priceless experience of overcoming of the consequences of large-scale catastrophes of both man-induced and natural origin.
- The role of the GC can hardly be overestimated:
 - It developed and managed all the emergency measures, directed and controlled the work of organizations and establishments of more than 40 ministries and departments including military forces;
 - It coordinated the activity of republic and local management bodies.

The decisions made by the GC were mandatory for the fulfillment within the entire territory of the country.

Governmental Commission (2)

- The GC became the carcass of the whole system of management of the activity on Chernobyl site. Around it, the task forces of ministries and departments, enterprises and establishments participated in the liquidation of the accident consequences formed. These GC had headquarters located in Chernobyl. Similar headquarters were established in the ministries and departments in the main location of the governmental and local organizations. This allowed maximum increase of the promptness in the development and making of decisions, and in their successful realization;
- Similar scheme of management was formed in the Ministry of Defense of the USSR. Task Force of the Ministry of Defense of the USSR was established following the Decision of the Task Force of the CPSU Political Bureau dated 3 May 1986 in order to manage the involved into the Chernobyl epic military troops. This Task Force located in Chernobyl. First Deputy to Chief of the General Staff was personally responsible for Chernobyl issues.

Governmental Commission (3)

The unique character of Chernobyl catastrophe raised wide circle in its scale and diversity:

- How to assess and forecast radiation consequences of the accident in Ukraine, Belarus, adjacent regions of Russia, and other countries?
- What shall be done with agricultural products, contaminated with the radionuclides? How to save (protect) the water bodies both underground and surface? How to protect the rivers from ingress and further migration of the radionuclides?
- How to cultivate farmlands? How to protect the tractor-drivers from the radioactive dust? How to organize the pasturage and feeding of the domestic animals?
- How to isolate the destroyed Unit - 4?
- How to decontaminate NPP and surrounding areas?
- What to do with the dust containing «hot particles» (fine dispersed nuclear fuel)?
- How to fight the dust transfer?
- Where to put the radioactive waste, how to isolate them reliably from the environment?

Governmental Commission (4)

- What as a whole the radioactive waste management system shall be in Chernobyl zone?
- What to do with «Red Forest» (forest in vicinity of ChNPP suffered of radionuclides fall – out)?
- What to do with «dirty» (contaminated) machinery?
- What is the best way to organize the work of involved military and civil divisions and organizations, how to arrange their living conditions, housing, remuneration? How to facilitate the safe conditions for their activity?
- What to do with the shutdown Units 1-3 of ChNPP? To return them into operation? When? And what shall be done for this? How to form the personnel of the Power Plant, where the personnel will live, where will the families of the Chernobyl NPP employees live?
- Finally, how to arrange the living conditions for the evacuated population, how to provide the population with the housing, food stuff, medical services, how to compensate them the material losses?
- What is the future of Pripyat town and other evacuated settlements? Is the return of population possible within the nearest future?

Governmental Commission (5)

The created in post – accident time scheme of emergency response management allowed promptly solving the priority tasks and transferring to the scheduled, systematic work to overcome the consequences of the accident.

In case of the large-scale man-made and natural cataclysms, when it refers to saving of the essential masses of population, harsh administrative and command system of management is the best and potentially the only correct approach - this is an important lesson of Chernobyl tragedy. An such conclusion do not contradict to democracy.

Important task - Scientific support to the emergency response. From the first hours after the accident the lead scientific organizations were involved into the solution of the problems connected with it. For the purposes of coordination of their activity, Council for scientific support of Chernobyl accident was established at Presidium of the Academy of Sciences of the USSR. Within no time the comprehensive program of scientific support was developed.

GC was in operation up to the crash of the USSR in 1991

Management of Chernobyl NPP (1)

- Management system of Chernobyl NPP was shaken to its foundation on April 26 – already by the morning the majority of the administrative and technical managers were overexposed and taken out of the NPP;
- After evacuation of Pripyat town, the administrative personnel worked in Chernobyl town (18 km from NPP). All personnel were moved to the kid's summer camp (35 km from NPP). Only the personnel of the shifts the number of whom was reduced to minimum was transported to NPP, as well as the necessary maintenance personnel. The work of entire personnel inclusive of the shift personnel was reorganized into 12-hour shifts;
- During May – June, prior the start of restoration works at Units 1 and 2, the number of the working persons was reduced to the necessary minimum: 600 – 650 persons. The rest employees were sent to medical treatment and for arrangement of the families after evacuation.

Management of Chernobyl NPP (2)

- Temporarily, for two months period, the position of the NPP duty officer was established in order to organize the interfaces with the arriving military troops, emergency brigades and specialists of ministries and departments;
- The departed managers and specialists were replaced by the personnel arriving from the other NPPs. At the end of May, more than half higher managers of Chernobyl NPP were substituted by the detached persons from the other NPPs;
- In May 1986, managers practiced the assignment to particular specialist of the responsibility for the certain piece of work critical for a given period of time. Such practice worked.

Management of Chernobyl NPP (3)

- The limit of annual dose of 25 rem was established for all the workers of NPP. NPP transferred to rotating schedule. Half of NPP personnel works for two weeks, then they were replaced with the second half, also for two weeks. Practically, only the Chief Engineer and managers of certain shops of NPP worked without replacement;
- The shift personnel of the NPP worked practically faultlessly. It demonstrated its stability under the heavy conditions of the accident. It coped with its tasks and undertook a series of unusual functions, in particular of administrative and technical management. The shifts independently determined the necessary number of personnel removing from the composition of the team those who was not needed in the created situation;

Management of Chernobyl NPP (4)

- The shift supervisors played an important role in the maintaining the morale of the NPP team. The role of shift supervisors significantly increased not only during the period of being on duty, but also during the period between shifts. The personnel had no permanent housing for several months. Thus, the shifts team spent the time between shifts at rear base where they passed the medical examination and rehabilitation. Naturally, the responsibility for the state of the team was rested on NPP shift supervisor. The multiple psychological researches of 1986 confirmed that the character of the shift as a team was defined by the character of the shift supervisor. Such correspondence was not noticed in the «peaceful» life;
- In spite of the permanently changing personal composition, the management system of NPP worked in accordance with the accepted in the energy sector rules for routine operation;
- Finally the decision was made which determined the tasks on commissioning of “reserved” Power Units 1 and 2. This governed the fate of the Chernobyl NPP and tasks of the collective.

Management of Chernobyl NPP (5)

- In the meantime, at the end of May, the working places of the NPP managers and personnel were redeployed slowly to the regular offices out of shelter that located under the NPP administrative building. The windows in offices were tightly batten down, closed with the lead sheets;
- GC met twice a day: in the morning and in the evening. It did not bother over trifles, providing the possibility to schedule the working time;
- The style of the relationship GC – NPP is extremely important for the understanding of the atmosphere in which the works were performed in 1986:
 - there was harsh control over the terms of implementation of GC errands, but
 - there was complete freedom in development and realization of the technical decisions intended to the achievement of certain goals.

This gave the possibility for the creative work. Never before or never after there was an opportunity to work in such atmosphere. No collective irresponsibility. Maximum concentration of forces. You make decision yourself and you care full responsibility for the implementation of it.

Management of Chernobyl NPP (6)

- Every morning the operative meeting was held to set the general tasks, first of all related to the recovery of the design infrastructure of the NPP, including the conditions of the personnel housing, meals, radiation protection, decontamination issues, and issues of the Units' maintenance and preparation of them for starting operation (practically, it were implemented overhaul of 2 Units in 3! months with many additional works connected to safety upgrading, assessment of exposure influence on electrical and I&C equipment, influence of corrosion (significant part of equipment were inundated), etc.);
- The second meeting was held in the afternoon and was fully dedicated to the issues of decontamination of the premises and territory of NPP, and emergency and recovery works. For the performance of these activities the military troops and contracting organizations were involved. NPP set tasks to the troops and contractors, never interfering into the issues of internal organization of them;
- There was one more unofficial operative meeting. During the lunch time, the NPP management and commander of the military task force and the local Commander of Staff discussed in "household furnishing" the tasks of coordination of the NPP and army activity.

Management of Chernobyl NPP (7)

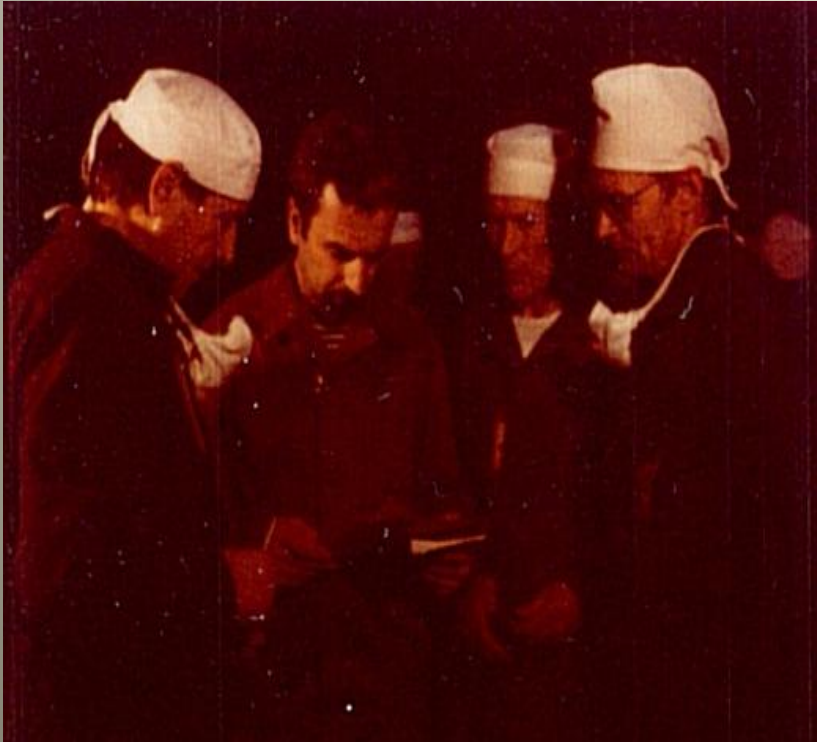
- The important issue in emergency – physical protection. There was no chance to keep the «peace» scheme. First of all, it was not physically possible to guard the territory from the side of the destroyed Unit - 4. Second, the emergency works required decisions related to the violations of the limits and conditions of the physical protection;
- The physical protection was arranged at the outer limits from the southern, south-western and north-western directions. From the side of the river, NPP was covered by the guards on motor boats, and later by the permanent posts. All buildings, including the main one, were transferred to the self-guarding by the operative personnel. As the radiation situation changed and the recovery works progressed, the guarding scheme also transformed. The design-based scheme was fully restored by the commissioning of Units 1 and 2. From the western side, the physical protection was restored simultaneously with the completion of the Shelter object construction.

Management of Chernobyl NPP (8)

In May, the decisions related to the schemes of the freights and people delivery to the emergency area and directly to NPP site were developed:

- A system of the sanitary treatment facilities (STF) was established in order to prevent the released of the contaminated vehicles and people from the NPP site, 10 km and 30 km zones;
- As the transport flows increased the new STFs were created in progress of recovery works;
- Three sanitary barriers between Chernobyl NPP and settlements «Белый пароход» (“White Ship”) and «Зеленый мыс» (“Green Cape”) were established aiming at prevention of radioactive contamination of the NPP personnel housing locations (the clothiers of the personnel are changed twice on the way from settlement to NPP and back).

01.10.1986 – Chernobyl NPP, Unit 1 returned to operation



30.11.1986 – Chernobyl NPP, Unit 4 “Sarcophagus” commissioned

