



# METHODOLOGY FOR CREATION OF THE COMPLEX EMERGENCY ALERTING SYSTEM

COORDINATING CENTRE: ECNTRM, Russian Federation

REPORT ON THE RESULTS OBTAINED WITHIN THE COORDINATED  
PROJECTS FOR 2015

## ECNTRM

### INTRODUCTION

The forecasted and unpredicted man-made and natural emergencies are to be addressed by a quick and coordinated action from all the emergency response services. Timely public alert and notification concerning possible emergency threats, ways to prevent them, and conduct in an emergency, and protective means, help reduce loss of life and material damage. The operational alert systems are designed to perform the aforementioned tasks.

All the federal authorities, authorities in constituent entities, municipalities, and organisations require timely and truly informing the population on the public and territory emergency protection condition, and also the measures taken to ensure safety, forecasted and actual emergencies, and protection means and ways, using the mass media, dedicated equipment for public en masse alert and notification, and other channels.

Current public alert systems operate at the regional, local (municipalities), and on-site (for potentially dangerous facilities) levels. An integrated public emergency alert system for the territories prone to dynamic dangerous natural phenomena and man-made processes is to be established.

The alert systems are built and maintained by the state executive authorities, regional executive authorities, and municipal authorities, and organisations on their respective territories (facilities) and within their authority.

The rapidly changing emergency risks (increasing scale, synergetic development of natural and man-made processes, emergencies of completely new threats), current telecommunication technology development level, intensive transportation infrastructure development, and construction of large-scale infrastructure projects, including those in the hard-to-reach places, public urbanization and a respective increase in the number of areas where people gather en masse, all the aforementioned factors require a revised approach to all the components of the further development of the notification and alert systems.

The growing emergency scale and disastrous development of the natural and man-made processes leading to an emergency, for instance, demand of much shorter time for public alert on an emergency threat or occurrence, while the public urbanization and more places where people gather en masse, transportation infrastructure development and reliance on the life-support systems require considerable improvement of the public safety culture, as well as new types and ways of notification and alert, and also an important concurrent percent increase in the coverage of the notification means, including emergency information and alert signals.

At the same time, there is a need for equipment capable of providing an urgent emergency notification to any single person living or staying on sparsely populated territories and hard-to-reach locations.

The current public emergency threat or occurrence alert and notification systems can be made faster only through process automation and human factor minimization and even elimination in some cases, as well as comprehensive integration and activation of the currently operational and newly established equipment and technology for public alert and notification, as well as multiple duplication of the channels used to deliver emergency signals.

This recommended practice is a set of opinions, fundamentals and guidelines for the establishment and development of the automated public emergency notification and alert systems.

# **1. ANALYSIS OF THE CURRENT PUBLIC ALERT AND NOTIFICATION SYSTEMS IN THE RUSSIAN FEDERATION, UKRAINE, ARMENIA AND AZERBAIJAN**

## **1.1 Current Alerts Systems Analysis**

The public is alerted by the emergency response services by way of various systems and equipment established by the federal executive authorities, regional executive authorities, local municipalities, and organisations.

### **1.1.1 Regional public alert systems**

Regional alert systems currently operational in the states are primarily designed for delivering the information and alert signals to:

- Civil Defense management in the region;
- Bodies responsible for protecting the public and territory from emergencies and/or civil defense in the municipalities;
- Public safety answering points (PSAP) in municipalities;
- Forces trained, aimed for and allocated (called) for emergency prevention and response, and civil defense forces in the region;
- Operations control desks (OCD) at the organisations operating potentially dangerous facilities;
- Population living in the respective region.

### **1.1.2 Municipal (local) public alert systems**

Municipal (local) public alert systems are designed for delivering the information and alert signals to:

- Civil Defense management in the municipality;
- Forces trained, aimed for and allocated (called) for emergency prevention and response, and civil defense forces in the municipality;
- Operations control desks (OCD) at the organisations operating potentially dangerous facilities;
- Population living in the respective municipality.

### **1.1.3 Facility alert systems**

Facility alert systems are designed for delivering the information and alert signals to:

- Civil Defense management at the organisations operating potentially dangerous facilities;
- Facility rescue units, including specialized ones;
- The employees of the organisation operating a dangerous production facility;
- Management and operations control desks of the organisations located in the facility alert system coverage area;
- Population living in the facility alert system coverage area.

The systems mentioned are to be established and maintained by the agencies and organisations responsible for the potentially dangerous facilities.

## **1.2 Current Public Notification Systems Analysis**

The public notification is done to inform the population on the forecasted or actual natural and man-made emergencies, measures taken to protect the population and the territory, protective methods and means, and also raising public awareness of civil defense, and protection of population and territory from emergencies.

Unlike public alert, public notification does not require immediate public protection action and is to be performed by all the federal authorities, regional executive authorities, municipal authorities and organisations.

### **1.2.1 Mobile telephone networks**

The mobile telephone networks have shown the most dynamic development in the past few years. The amount of devices connected to the mobile telephone networks is much more than the number of fixed-line telephone service subscribers.

The 2G technology is the major one in the mobile telephone networks, the 3G technology demonstrating the most dynamic growth, which is a four-time increase in two years.

The important population and territory coverage makes the mobile telephone networks an attractive means to notify the population on the threats coming from natural and man-made emergencies.

The following action is currently taken to improve the use of mobile telephone networks:

- Regulatory action for operators' performance in an emergency and ensuring hardware and software integration between their equipment and the automated information platform of the emergency response services;
- Introduction of mechanisms for standard mobile telephone networks technology application like Cell Broadcast/Interactive Cell Broadcast into the comprehensive public notification and alert system.

### **1.2.2 Telephone and Radio Broadcasting Networks**

Telephone and radio broadcasting are the most spread information systems covering almost all population, which makes them a major public notification and alert channel.

The on-the-ground segment of the state television and radio broadcasting network is comprised by the regional, republican, territorial and provincial radio and television broadcasting centers, which are part of the single state television and radio broadcasting operator responsible for on-the-ground broadcasting of all mandatory public television and radio channels throughout all the territory of the states, and also for establishing and deploying digital on-the-ground networks for broadcasting mandatory television and radio channels.

The television and radio broadcasting networks are optimised for public alert needs the following way:

- Reliable digital television and radio broadcasting networks are built for guaranteed and targeted alert and also public notification;
- VHF radio broadcasting networks are developed in the rural areas;
- Current wire broadcasting networks are preserved and maintained for public alert system application;

The private (municipal) television and radio broadcasting companies are used for the public alert and notification, for instance, through agreements for cooperation in case of emergency threat or occurrence.

### **1.2.3 Fixed line telephone communication networks**

Despite the rapid development of the mobile communication networks in the past years, the fixed line telephone communication networks are still well-spread throughout the country, but are in limited use for notification and alert, that is largely for autoinformer-based alert of the response forces management. The potential of this communication type will be significantly increased when new software-based switching systems (like soft-switch) are introduced there.

### **1.2.4 The Internet**

The Internet is clearly a promising channel for public urgent notification and alert but is currently in an extremely limited use.

## **Conclusions**

The capacity of the modern digital information and communication technologies, the development of multi-service communication networks, the establishment of digital television and radio broadcasting networks require the organisational and technical solutions previously used to create the current alert and notification systems at all managerial levels to be revised. Comprehensive approach is needed to perform the emergency public alert and notification tasks by using all available equipment, including the communication and broadcasting means, which are supposed to complement each other.

## **2. COMPREHENSIVE PUBLIC EMERGENCY ALERT SYSTEM (CPEAS) DESIGN, GOALS, STRUCTURE AND APPLICATION**

**2.1 The CPEAS is designed** for timely and guaranteed public alert in the emergency alert areas with the use of up-to-date information and communication technology and software and hardware suites (equipment and end devices), whose type and kind are determined depending on the emergency alert area features (passport), dangerous natural and man-made processes the area is prone to, and also the population groups, which can be in the area.

### **2.2 The CPEAS is to perform the following tasks:**

- To deliver timely and in a guaranteed fashion the information on an emergency threat or occurrence, rules of conduct and protection ways in conditions like that to every person in the area featuring an emergency threat, or in the emergency area;
- To alert the disabled people and other people with health constraints differentiated by the constraints;
- To transfer the required information and alert signals (audio, video, characters and figures, and other) in an automatic and automated fashion for adequate perception by the public in case of an emergency threat or occurrence;
- To have integration capacity for the equipment receiving, processing and transferring the audio and/or audiovisual, as well as other messages on an emergency threat or occurrence, rules of conduct and protection ways in situations like that;
- To have an automatic and/or automated integration capacity with software and hardware suites for decision-making used by the emergency response services;

- To have an automatic and/or automated integration capacity between the public alert systems and the systems for monitoring potentially dangerous facilities, natural and man-made emergencies;
- To apply up-to-date information technology, electronic and printed mass media for the timely and guaranteed public alert on an emergency threat or occurrence, rules of conduct and protection ways in situations like that;
- To timely transfer information to the emergency response services of a respective level to take necessary action for public protection;
- To support the end alert and notification means control from the respective emergency response service desks;
- To transfer information in preset modes (personal, selective, circular, and by groups according to preset programs);
- To protect information from unauthorized access and provide information integrity in case of system failures.

### **3. COMPREHENSIVE PUBLIC EMERGENCY ALERT SYSTEM**

#### **REQUIREMENTS**

##### **3.1 Requirements to defining public emergency alert areas**

3.1.1 When the public emergency alert areas are defined, the risks present on a given territory of the country and possible scale of their development are to be taken into consideration.

##### **3.1.2 The natural threats are supposed to mean:**

- Geophysical dangerous phenomena;
- Volcanic eruptions;
- Geological dangerous phenomena: landslides, landfalls, slide rocks, avalanches, mudslides, slope ablations, subsidence of loess and land surface caused by karsts, abrasions, erosions, dust storms;
- Weather and agrometeorological dangerous phenomena: storms, hurricanes, whirlwinds, gusts, vortexes, large hail, heavy rain, snowfalls, snowstorms, fog, droughts, hot winds, cold spells;
- Sea hydrologic dangerous phenomena: tropical cyclones (typhoons), tsunamis, strong sea surges, strong harbor seiches at ports, early ice cover or fast ice, ice pressure, intense ice drift;
- Hydrologic dangerous phenomena: high water levels (high water, rain floods, jamming, ice jams, wind tides), low water level, early freeze-up and occurrence of ice on navigable water bodies and rivers, ground water rise (underflooding); natural (landscape) fires: forest fires, steppe and grain area fires, turf fires;

##### **3.1.3 The man-made threats are supposed to mean:**

- Chemically hazardous facility accidents;
- Radiation hazardous facility accidents;
- Fire and explosion hazardous facility accidents;
- Hydrodynamically hazardous facility accidents;
- Transportation accidents (railway, motorcar, aerial, water, metro);
- Utility and power grid accidents.

### **3.2 The CPEAS is to have the following control levels:**

- Federal (on the territory of the country);
- Regional (in the constituent entities);
- Local (in municipalities);
- Facility/on-site (on the territory of potentially dangerous facilities).

### **3.3 The CPEAS operating requirements**

3.3.1 The CPEAS is to be round-the-clock operational and ready for use.

3.3.2 The CPEAS is to provide timely, guaranteed and accurate alert signals and emergency information delivery to the public in the emergency alert areas.

3.3.3 The time required for the alert signals and emergency information delivery to the public from the moment the reliable data on a natural or man-made emergency threat or occurrence is received should be such as to ensure the necessary action for public protection (engineer, radiation, chemical and biological protection, evacuation, and other action).

3.3.4 The CPEAS is to have 100% population coverage for those on the territory of an emergency threat or occurrence.

### **3.4 The CPEAS technical requirements.**

3.4.1 The CPEAS is to support the following alert signals and information transfer modes:

- Circular;
- Circular by preset programs;
- Selective within one CPEAS level;
- Selective (over one or two levels) by preset programs.

3.4.2 The CPEAS systems of all managerial levels are to be integrated in terms of software and hardware.

3.4.3 The CPEAS is to have a throughout centralized and decentralized operation capability.

3.4.4 The CPEAS is to support information exchange between the automatic, automated, manual and dialogue levels.

3.4.5 The CPEAS is to support transfer and reception of confirmations on the transferred alert signals and emergency information at all levels.

3.4.6 The CPEAS is to:

- Represent and document the transferred alert information, data and reception confirmation in an automated fashion;
- Document actions taken by the on-duty officer managing the alert system;

- Support an „override“ capability for the alert network by a daily management body of the higher level;
- Support remote control for public and authorities alert means;
- Have information input into the alert system from an industrial personal computer;
- Transfer pre-recorded voice messages or microphone messages;
- Transfer voice and video information from broadcasting studios of the broadcasting operators.

3.5 The CPEAS integration requirements for monitoring software and hardware suites, forecasting, surveillance, and laboratory control systems.

3.5.1 The CPEAS is to support input and processing of the emergency information coming from the monitoring, forecasting, surveillance, and laboratory control systems, which receive and process the formalized messages on the emergency threat or occurrence (further to be referred to as control systems).

3.5.2 The CPEAS is to be software and hardware integrated with the automated information gathering, processing, and presentation suites of the control systems at all levels.

The alarm systems are to be automatically launched when the sensors of the monitoring systems for dangerous natural and man-made processes are actuated.

3.5.3 The CPEAS control systems“ information output is to be done through standard data communications protocols to be processed by the integration modules and command generation for actuating different levels of the CPEAS.

3.5.4 The CPEAS integration with the control systems is to support both an automatic (no operator participation) and an automated operation mode.

### **3.6 General requirements to communication networks for the CPEAS set-up.**

3.6.1 The public is to be alarmed of an emergency threat or occurrence by the fixed-line telephone, mobile telephone (cellular) networks, television and radio broadcasting networks, the Internet, the electrical and electronic acoustic horn networks, street public address systems, mobile alert means, and other means.

3.6.2 Recommendations on the use of the fixed-line telephone, mobile telephone (cellular) networks, television and radio broadcasting networks, and the Internet for the CPEAS.

#### **3.6.2.1 Mobile telephone (cellular) communication**

The Cell Broadcast technology and short messages delivery are to be used for the mobile telephone (cellular) communication alert.

When the short messages are sent to the public for the mobile telephone (cellular) communication alert, the following capabilities of the federal and regional mobile operators are to be taken into consideration:

- The number of mobile operators servicing a given region and the number of their subscribers;
- Operator coverage areas in a given region with the indication of installed satellite communication basic stations;

- The technical capacity of the regional communication operator representative offices to perform broadcast or short message distribution.

The message text is to be not more than 140 (100 lines) Cyrillic letters (the message size is subject to change based on technical capabilities and approval) to be delivered by the mobile radio and telephone communication network and within 15 minutes.

The cell network public alert via the Cell Broadcast technology is to be performed using pre-prepared and pre-approved texts. The communication operators are banned from introducing changes to the message texts.

### 3.6.2.2 TV and radio broadcasting

The TV and radio broadcasting based public alert is to be performed under applicable law.

3.6.2.3 The electrical and electronic acoustic horn networks, street public address systems are to be set up based on the fixed-line telephone communication network, the dedicated digital IP VPN communication network of the executive authorities of the regions and municipal authorities, as well as the communication networks of the potentially hazardous facilities.

The Internet public alarm is to be performed by publishing emergency information on the official specialized websites, as well as the major news and search sites.

3.7 To maintain the CPEAS sustainability the following has to be provisioned:

- The CPEAS hardware suites are to be located in the facilities, which are protected from the emergency hazards;
- Several geographically distributed communication systems (channels, lines) are to be jointly used for one alert direction;
- The CPEAS hardware suites and communication lines are to be backed up;
- The mobile alert means are to be kept and used in store;
- Power supply is to be guaranteed;
- An industrial personal computer is to be used as part of the alert systems.
- If the devices, blocks, cabinets, etc. are opened, a signal is to be transferred to a control desk for a corresponding level of the alert system;
- Component parts are to be checked for proper functioning and a signal is to be transferred to a control desk for a corresponding level of the alert system;
- The equipment is to be protected from unauthorized launch, as well as mistaken actions of the on-duty officer and maintenance staff;
- The alert equipment suites used for the CPEAS are to be software and hardware integrated.

3.8 The CPEAS is to alert and notify all public groups, including the disabled people and other people with limited health capabilities considering the different limitations and by using various communication, broadcasting, and alert equipment.

#### **4. ESTABLISHING A COMPREHENSIVE PUBLIC EMERGENCY ALERT SYSTEM - MAJOR STAGES AND PROCEDURES**

##### **4.1 The Comprehensive Public Emergency Alert System Setting-up Stages.**

###### **4.1.1 Stage I**

- To define and determine by law the list of areas requiring the CPEAS establishment based on the identified and current natural and man-made threats in the areas.
- To examine the current emergency monitoring and forecasting systems, public alert systems in the region, and at the facilities, including by social research.
- To design technical and organisational solutions to integrate the current public alert systems with the emergency monitoring and forecasting systems, and to set up the CPEAS.
- Based on the abovementioned data analysis, it is advisable to determine the funding sources for setting up and upgrading the public alert systems, their integration with the monitoring and forecasting systems, including by the targeted programs.
- The regional authorities are to adopt respective legislation on the activities to be performed to establish the CPEAS on their territory.
- The selection of the areas where the CPEAS is to be established is to be included in the territorial planning documents.

###### **4.1.2 Stage II**

- To design and build extra CPEAS elements in the public alert areas as defined by the legislation adopted by the regional executive authorities;
- To place orders for the specialized equipment purchase and delivery.

###### **4.1.3 Stage III**

- To have the equipment delivered, installed and commissioned. To train the control officers to operate the CPEAS software and hardware.
- To develop agreements, regulations, and instructions on public alert.
- To align the local public alert systems with the corresponding legislation.
- To perform training sessions, exercises and drills on the CPEAS operation and readiness.
- To teach the public the rules of conduct and activities when receiving the alert signals.

- To have the CPEAS commissioned in a constituent entity.

#### **4.2 Working procedure for establishing a comprehensive public alert system**

4.2.1 The different levels of CPEAS are to be established by a rule (decree) of the executive authorities of a constituent entity, municipal authority, or the potentially hazardous facility manager. It defines the customer, goals and tasks, procedures, funding sources, major stages and responsibilities.

An action plan for establishing the CPEAS is designed based on the rule (decree).

4.2.2 The CPEAS establishment per se is to have three major stages:

- Design preparation and design;
- Installation and commissioning;
- Acceptance and introduction into service.

4.2.2.1 Stage I:

- To draft technical requirements (TR) for the CPEAS set up project design;
- To select project organisation and conclude an agreement for the project work;
- To do the project work;
- The project to be accepted, inspected and approved.

The TR for the CPEAS setup is the main document defining the system requirements and the setup procedure, which is used for performing the setup work and acceptance.

The TR for the CPEAS setup is designed by an executive authority body of the constituent entity, municipality, and the operator of the potentially hazardous facility.

The following is to be considered while designing the TR:

- The condition of the natural and man-made threats monitoring and forecasting systems;
- The features of the organisational and technical structure of the territorial communication and broadcasting networks;
- The features of the organisational and technical structure of the territorial and local alert systems;
- The features of the communication and broadcasting networks in the potentially hazardous facility areas and prospects of their development;
- The presence and location of populated areas, other potentially hazardous facilities and economy facilities, areas, where people gather en masse, etc., which are within the alert area.

#### 4.2.2.2 Stage II:

- The major contractor and subcontractors to build the system are to be selected;
- Agreements are to be concluded for equipment purchasing, construction, and installation, and commissioning activities;
- Equipment is to be procured and delivered under the project;
- Construction, installation, and commissioning activities are to be performed.

Before the CPEAS is accepted for operation, the major contractor does the following with the customer's participation:

- Performs commissioning activities, including inspection, adjustment, tuning, training and electric adjustments for individual equipment, as well as preliminary tests to make sure the system satisfies the TR requirements, which are to be used for setting all the equipment and system parameters to the specified values;
- Jointly with the customer drafts the certificates to certify that the CPEAS and the equipment installed satisfy the approved project, including the measurement, test, and trial results for the equipment and the system;
- Drafts and coordinates with the customer the schedule and methodology for the acceptance tests and submits them to the customer for approval.

#### 4.2.2.3 Stage III: system acceptance for operation.

The CPEAS is to be accepted for operation under the current legislation, instructions and guidelines effective in the country.

The CPEAS acceptance for operation is launched under the ruling (order) of the head of the authorized body of the executive authority of the customer (head of a potentially hazardous facility), which establishes an acceptance committee, defines its composition, timeframe, purpose and goals, as well as the responsibilities of the committee members.

The acceptance committee operates under a chair. The customer and the major contractor provide the necessary working conditions.

The order establishing the acceptance committee is used to design the acceptance committee action plan, which is submitted to the chair for consideration.

The acceptance committee action plan determines: the composition of the working groups (not necessarily from the committee members), which are to examine whether the technical requirements for the CPEAS setup have been met; inspection date, the technical requirement points to be inspected; program points and test methodologies, which are used to check whether the CPEAS satisfies the TR requirements.

A member of the working groups is selected to be responsible for the timely inspection, and drafting and submitting to the committee for consideration the test reports.

The test report includes the test results, comments and recommendations for the system operation, as well a conclusion on whether the TR item under examination is satisfied.

If the tests lead to a split of opinions, a member of the working group is entitled to noting a different opinion in the report.

The test report is signed by the working group members and submitted to the acceptance committee for further consideration and approval by the committee chair.

Having considered the test reports the acceptance committee drafts a statement indicating the goal and major outcomes of the acceptance committee operation, major comments and recommendations provided by the working groups" members, a conclusion whether the CPEAS satisfies the TR demands, and recommendations on accepting the system for operation.

The statement has the following documents attached:

- reports by working groups;
- estimate showing that the CPEAS satisfies the TR demands;
- comments and recommendations on the acceptance committee work outcomes including timelines for addressing and implementing the recommendations, as well as those responsible for the job.

The statement is to be signed by the committee members and submitted for adoption to the customer manager.

If individual members of the committee have justified objections, they are to be considered before the statement approval with a participation of the organisations represented by the committee.

If the acceptance committee conclude that the CPEAS cannot be accepted for operation, then instead of drafting the statement, they draft a report with justifications and grounds, as well as references to the acting legislation and rules provided (which is signed by the committee members) and recommendations on the measures to be taken for acceptance for operation.

The CPEAS is legally accepted for operation based on a respective decree (a ruling) by an executive authority body (municipality head, head of potentially hazardous facility).

4.3 All the equipment suites used for setting up the CPEAS are to be acceptance tested to comply with the acting requirements.

4.4 The equipment suites used for setting up the CPEAS installed on the communication networks are to be certified by a respective authority.

## **TECHNICAL REQUIREMENT FOR ESTABLISHING CPEAS**

### **1. General Terms**

#### 1.1 The CPEAS designation

The CPEAS full title and designation, and the public alert area are indicated.

## 1.2 Grounds for setting up

The prescriptive documents for establishing the CPEAS and the authorities, which issued the documents and the dates of issue are indicated.

## 1.3 The CPEAS purpose and goals

### 1.3.1 The CPEAS purpose

The system purpose is indicated.

### 1.3.2 Goals

The CPEAS indicators are named and their required values are identified.

## 1.4 The customer

The full name and banking details of the customer are identified.

## 1.5 Head provider

The full name and banking details of the head provider are identified.

## 1.6 Co-providers

The full name and banking details of the co-providers are identified.

## 1.7 Major contractor

The full name and banking details of the organisation performing the construction, installation, and commissioning activities are identified.

## 1.8 Schedule

The major stages of the design, construction, installation, and commissioning activities are identified with the starting and ending time.

If needed, time for document provisioning is identified (technical and economic calculations, project drafts, etc).

## 1.9 The procedure of input data provisioning by the customer.

The timeline, procedure and ways of input data provisioning by the customer to the head provider are identified.

## **2. Current Alert, Monitoring, and Forecasting Systems Description**

The current systems operational on the territory are briefly described with their operating conditions mentioned or references to corresponding documents are made.

## **3. Requirements to CPEAS**

### 3.1 General requirements to the CPEAS.

### 3.1.1 Structural and functional requirements.

The following is indicated:

- Major goals;
- Control desks number and location;
- Specific coverage area, the populated areas and regions included into the system;
- List of subsystems, their purpose and major features, hierarchy levels, and centralisation requirements;
- Requirements for communication with adjoining systems, including integration parameters, and information exchange methods (exchange protocols);
- Operation modes requirements;
- Diagnostics requirements;
- Development and upgrade prospects.

### 3.1.2 Staff number, skills, working schedule requirements.

The following is to be indicated:

- Staff required for operations and maintenance;
- Skills required of operations and maintenance staff, training and control of knowledge and skills;
- Working schedule requirements for operations and maintenance staff.

### 3.1.3 Reliability requirements.

The parameters used for establishing the degree of the CPEAS conformity with its purpose are indicated, including:

- List and values for the reliability parameters of the system and subsystems;
- List of situations when reliability requirements are to be regulated and values of respective parameters;
- Reliability requirements for equipment and software;
- Requirements to the assessment and control methods for the reliability indicators for various stages of the CPEAS reconstruction.

### 3.1.4 Safety requirements.

The safety requirements for installation, adjustment, operation, maintenance and repair of the CPEAS equipment are identified.

### 3.1.5 Ergonomics and technical aesthetics requirements

The CPEAS indicators determining the necessary quality of the human to machine interaction and comfortable working conditions are identified.

### 3.1.6 Operation, maintenance and repair requirements

The following is identified:

- Operation conditions and schedule (mode), which are to ensure the use the CPEAS equipment with the specified technical indicators, including the types and frequency of maintenance of the system equipment or no-maintenance operation tolerance;
- Requirements to the composition, location, and storage conditions for the spare parts and tool kits;
- Preliminary requirements to the area needed for the staff and system equipment, power supply grids, etc.

### 3.1.7 Requirements to information protection from unauthorized access.

Requirements of the standard technical documentation are identified.

### 3.1.8 Requirements to information preservation in case of accidents.

A list of events is provided, including accidents, equipment failures (including power blackout), etc., in which the CPEAS information is to be preserved.

### 3.1.9 Extra requirements. The following is indicated:

- Requirements to the system tools for staff training;
- Requirements to the maintenance equipment, system element testing desks;
- Requirements to the CPEAS related to specific operation conditions;
- Specialized requirements defined by the developer or the customer.

### 3.2 Requirements to support types.

The requirements to the information, technical, meteorological, organisational, methodological, and other types of support are identified.

#### 3.2.1 The following requirements are listed for the information support of the system:

- Information exchange between the system components;
- Information compatibility with the adjoining systems;
- Data protection in case of accidents and power failures;
- Data control storage, refreshment, and recovery.

3.2.2 As for the technical support of the CPEAS, the requirements to the types of equipment are listed, including the types of equipment suites, software and hardware suites, and other component parts authorized for use in the system. The list of alert and monitoring equipment, which is in the core of the CPEAS under construction, is defined.

3.2.3 The meteorological support requirements list the following:

- The meteorological support requirements for the equipment and software, which are part of the system measurement channels, and embedded control tools;
- The type of meteorological certification (state or agency) indicating the procedure and the certifying organisations.

3.2.4 The organisational support lists the following requirements to:

- The structure and functions of the units participating in the system operations or supporting operation;
- The way the system functioning is organized;
- The protection from mistaken actions by the operating and maintenance staff.

#### **4. Extra Work Requirements**

4.1 Specified and expanded TR.

A procedure is discussed for coordinating with the customer the possible specific requirements and separate TR items for initial data gathering, requirements justification, etc.

4.2 Initial data.

The initial data are listed to be provided by the customer to the provider for doing the job (communications and alert system schemes, conditions for locating the alert equipment, etc.).

4.3 Design and estimate documentation (DED).

It lists:

- The regulations used by the provider to design the DED and calculate the standard design time;
- If the DED is to be prepared in a short period of time, extra pay is coordinated for shorter than standard design time, and a document for payment is identified;
- It is indicated that the DED under development is to be integrated with the previously issued typical project materials. To save the work volume, some of the solutions described by the aforementioned materials can be left out.

The list, composition and volume of the major and supporting DED to be presented by the provider to the customer is defined, and requirements to individual documents are discussed when needed.

A DED list example:

- the CPEAS organisational and technical layout with an interpretive note;
- sound emitting devices location schemes with sound coverage areas shown on the maps of the populated areas;

- schemes for placement and installment of alert equipment;
- junction wiring scheme considering the integration of all the equipment to be installed;
- technical specifications for equipment, cable products, and other materials;
- estimate calculations.

### **5. CPEAS Setting up Scope of Work**

It is to have a list of work stages for setting up the CPEAS, the deadlines, list of companies performing the work, references to documents confirming the agreement of the companies to participate in establishing a system or a record determining the responsible party (the customer or the developer) for performing the work.

This section also includes:

- the list of documents to be provided when a stage of work is done;
- the procedure and type of technical documentation inspection (the stage, the list of documents inspected, the inspection procedure).

### **6. Requirements to Work for CPEAS Commissioning**

It gives a list of major activities for commissioning the CPEAS and their providers.

It stipulates the procedure for documenting and presenting to the customer the results of the work done to reconstruct the systems (its parts), to manufacture and adjust separate units (technical, software, etc.) and software and hardware (software and methodological) suites of the system.

### **7. CPEAS Control and Acceptance Procedure**

It indicates:

- the overall requirements to work acceptance by stages (the list of companies and enterprises participating, performance place and time), the procedure for coordinating and approving the acceptance documentation;
- the number of the DED copies and distribution list;
- the procedure for approving the DED (initial data) with the customer and companies concerned, as well as handover and acceptance of the ready product;
- the types, composition, scope and methods of the system and component parts tests;
- the acceptance committee status (state, interagency, agency).

## **INSTRUCTION MANUAL OF THE COMPREHENSIVE PUBLIC EMERGENCY ALERT SYSTEM (CPEAS) FOR THE DECISION-MAKING COMMUNITY**

Regional CPEAS is based on a hub scheme in accordance with the state administrative-territorial division and represents a hierarchical structure, consisting of the following alert subsystems:

- regional link alert level;
- local link alert level;
- facility link alert level.

Main tasks of the regional link alert level:

- warning and informing the forces of constant readiness of the regional level, as well as population at risk and emergencies;
- management of local and facility alert subsystems;
- broadcasting signals and notifications received from regional and state subsystems;
- interaction with electronic media;
- collection, analysis and documentation of alert results (informing).

Main tasks of the local link alert:

- warning and informing the forces of constant readiness of municipalities and population at risk and emergencies;
- management of facility (local) alert systems;
- broadcasting signals and notifications received from regional systems;
- interaction with electronic media;
- collection, analysis and documentation of alert results (informing).

Main tasks of the facility link alert:

- warning and informing the forces of constant readiness of facilities (organisations), their personnel and population in the area of facility link at risk and emergencies;
- management of alert systems technical equipment;
- broadcasting signals and notifications received from regional and local alert systems;
- interaction with facility electronic media;
- collection, analysis and documentation of alert results (informing).

Operational duty services of any level of management should have the ability to inform entities (organisations) and individuals located in the area of these rescue services responsibility. In case of failure of the duty service of intermediate or lower level, the higher level should have the opportunity to alert subscribers of the lower level.

The alert links should provide interfacing with information systems of the organisations and institutions that are the sources of information about the threat or occurrence of a disaster.

Sources of information for decision making at using the regional CPEAS when emergencies are institutions and organisations stationed in the area and carrying out continuous monitoring of the environment and potentially dangerous objects.

Information about emergency situations of natural character comes:

- the occurrence of forest and peat fires - from the relevant departments of forestry, forest protection air bases, the forest enterprises and logging enterprises;
- the threat of flooding areas due to heavy precipitation - from hydrological stations of the weather service;
- the threat or occurrence of earthquakes, floods, tsunamis - from dispatchers or from the alarm systems (if any);
- the avalanche and debris flow hazard - from the observation posts of avalanche and mudflow hazards;

Information about occurrence of emergency situations of man-made character comes:

- the threat of radioactive contamination - from automated monitoring systems and control services at NPP;
- the threat of breakthrough pressure of the front of the waterworks – from automated monitoring systems and control services of hydrosystems;
- the threat of chemical contamination - from automated monitoring systems and control services monitoring chemical objects;

Between sources of information and operational on-call services of any management level direct information ways are to be organized.

Alerts links management is provided by the operational services of the appropriate level of management.

Informing the relevant authorities, officials and forces about instructions is carried out in the form of transfer of conditional speech or formal signals through regional CPEAS.

The regional CPEAS use for notification of subordinate management bodies, officials and forces, and the procedure for bringing the conventional signals in each link of the alert are determined by the relevant head of constituent entity of the country.

As technical means to bring the conditional signals to the management bodies and officials special equipment alerts, office and home phones of officials, the terminal devices of mobile networks are used.

To alert the population in residential and industrial area electric sirens, radio and television broadcasting, the terminal devices of mobile networks are used.

The decision on the activation of the alert systems is taken by:

- regional CPEAS for notification of the population - the Executive authorities of the corresponding constituent entity of the country;
- municipal alert system - the appropriate local authority;

- local alert system – the head of the organisation operating potentially hazardous object.

The texts of the speech messages for warning the population are recorded in advance on electronic media, stored at the workplace of the operational duty service of the country constituent entity territorial authority management.

In extraordinary urgent cases, transmission of alerting short voice messages is allowed directly from the working places by the specially authorized operational services.

For notifying the population about alarm audible signals of outdoor sirens, signal-loud-speaking installations of central and local launch, the terminal devices of mobile networks are used.

Voice messages are transmitted to the population by networks of wired and radio broadcasting and sound of television programs.

Notification of the population in transport is provided by technological communication systems and alerts of the appropriate transport mode. Warning and informing people in the points of embarkation and debarkation (railway stations, airports, metro stations) is done by the dispatch service of the transport object using departmental broadcasting nodes and networks of external speakers, set at these points to inform passengers. For this purpose they need to be installed by electric sirens with local start, electronic display, signal loud-speaking system.

Warning and informing passengers in vehicles in transit are carried out by internal translating means by the officials of the train crew (crew of sea, river and air vessels) on the basis of information received from the manager of the respective vehicle body by means of technological, departmental communication.

The alert systems of the transport authorities should be matched with the relevant territorial and local levels of alert. Constant communication is established between the duty shift of the transport authorities and the operational duty service of the relevant authorities.

Operating on duty must have the ability to run alert system tailored to the specific situation, including:

- to generate signals or information of notification;
- to identify scenarios for communicating signals and data alerts;
- to assign the recipients of signals and information alerts.

Generated alarms and information alerts should be reported to all recipients according to well-known scenarios. In addition, it should be possible to promptly form the script alert on a non-standard scheme. Alert system management should be done from the automated workplace of operational duty.

The alert system provides feedback (receipt of confirmation) to control the signals and information alerts dissemination, and for remote testing of alerts.

In the process of alert information about it is to be collected and displayed, as well as reports on the final results of officials alerting.

For alerting the public outside the premises (buildings) unified sound emitters (acoustic drum set) are used to provide for a specific alert sound power and ability to broadcast sirens or voice information:

- from the speaker through the microphone installed in the control room;
- from the system of converting printed text into speech;
- from its own controller, in which voice information in digital form is recorded in advance.

Regional CPEAS constantly operates in the mode of constant readiness to be deployed as intended.

The transmission of information or alert signals can be performed both in automatic and manual mode.

Basic mode is automated. It provides circular, group or selective dissemination of information and alerts to management bodies, forces and means, population.

In manual mode, dissemination of information and alerts to the management bodies, forces and means, population is carried out in a differentiated way, selectively connecting the objects of notification to the communication channels at the time of transmission.