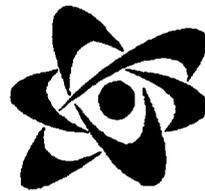




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INTERNATIONAL CONFERENCE ON THE STRENGTHENING OF NUCLEAR SAFETY IN EASTERN EUROPE

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**REGULATORY ASPECTS  
OF NPP SAFETY**

**REPORT PRESENTED BY  
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**COMMITTEE ON THE USE OF ATOMIC ENERGY  
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## **1. Introduction**

The nuclear energy power program in Bulgaria started at the end of the 60's. At that time an agreement was signed with the former Soviet Union for supply of WWER power reactors for electricity generation. The first stage of the program envisaged four WWER-440/B230 power units to be constructed on the site of the Kozloduy NPP. The first two were connected to the national power system in 1974 and 1975. The third and the fourth were completed and put into operation in 1980 and 1982.

The increase in the use of electricity brought about the construction of additional two power units on the Kozloduy NPP site, equipped with WWER-1000/B320. The units were put into operation in 1988 and 1993.

During recent years the Kozloduy NPP has generated about 42-45 % from the country annual electricity production, with an average load factor of 50-55 %.

## **2. Description of the national system for monitoring the nuclear power**

Under the Constitution of the Republic of Bulgaria, the Council of Ministers pursues the state internal and external policy in compliance with the Constitution and the laws. The Council of Ministers governs the implementation of the state budget, organises the management of the Governmental property, signs, approves and denounces the international contracts in cases envisaged by the law. In fulfilling its functions the Council of Ministers has the right to establish bodies such as committees, commissions, agencies, councils, in order to pursue the state policy in a definite area.

The Committee on the Use of Atomic Energy for Peaceful Purposes (CUAEPP) is the main regulatory body in the field of nuclear safety and radiation protection. It exercises the state control through the Inspectorate on Safe Use of Atomic Energy (ISUAE),.

The Ministry of Health, the Ministry of Internal Affairs, the Ministry of Environment and Waters and other state authorities, exercise control within the framework of their competence.

### ***Ministry of Health***

The Public Health Act and the Public Health Act Enforcement Regulations determine the Ministry of Health's and its control bodies' functions. The organisation of radiation safety control activities is determined by the Regulations on Radiation Safety Control Bodies' Structure.

The Ministry of Health in co-operation with other state authorities permits and controls the import, export, production, storage, use, transportation and making harmless of nuclear material and other sources of ionising radiation, within the framework of their legal competency. The Ministry of Health is the authority that permits and controls the use of sources of ionising radiation for the purposes of medicine. In case of radiological emergency, the Minister of health sets additional sanitary standards, aiming public protection. Also, the Minister of health determines the obligatory sanitary standards in all

radiation protection areas. The National Centre on Radiology and Radiation Protection is the specialised sanitary control authority in the field of safe atomic energy utilisation. Subjects of state sanitary control are all activities with ionising radiation.

### ***Ministry of Internal Affairs***

The structures of the Ministry of internal affairs are mainly responsible for the physical protection and the fire protection of the NPP. The Security Services of the Ministry of Internal Affairs perform the following activities: collection of information from different sources about intention of persons or groups of persons for planning and preparing for implementation of illegal actions or inaction, related to nuclear facilities and nuclear material; collection of information on deliberate activities or inaction, leading to violation of technological processes and instructions and causing premises for nuclear accidents and radiological emergencies; distribution of gained information among corresponding boards of the interested authorities, which are able to apply necessary measures for mitigation or prevention of injurious sequences; preliminary inspection of the reliability of candidates to pass to the security area or internal areas for work with secret materials or physical protection information, as well as external persons visiting the nuclear facility; preliminary inspection of accidents, for which malice aforethought is suggested, as well as other accidents with casualties (victims) or danger for the public health; control over the protection of state secret and physical protection information;

Security activities are carried out in close co-ordination with organisations and persons possessing permits for exercising of atomic energy utilisation activities, physical and fire protection services, as well as with corresponding national, central and territorial services of the Ministry of Internal Affairs.

### ***Ministry of Environment and Waters***

The Protection of Environment Act determines the control over environment states and over sources of contamination, as a basic function of the Ministry of Environment and Waters (MEW). All activities of physical persons and legal entities can be put under assessment of the impact on environment. For energy industry projects of national and regional importance, it is obligatory an impact assessment to be carried out. Among them are: nuclear power plants and other nuclear reactors, except research reactors with power less than 1 kW; facilities, exclusively aiming storage, final disposal and/or reprocessing of radioactive wastes and irradiated burning materials; facilities for nuclear fuel mining and enrichment.

MEW operates national automated system for monitoring of the gamma-background in the Republic of Bulgaria. The system comprises of 26 local monitoring stations, each of them contains a gamma-probe and a detector for rain. 9 are equipped with meteorological detectors. In addition there is a mobile monitoring station, which gives the possibility of monitor the radiological and meteorological parameters, and to perform on-site gamma-spectrometry sampling. The central station of the system is in MEW. Additional monitoring centres exist at the CUAEPP, Civil Protection Directorate. In addition the regional structures of the MEW operate laboratories on radiological measurements.

## ***Ministry of Defence - Civil Protection Department***

Civil Protection Department exercises the functions of the operative headquarters of the Public Protection in Cases of Calamities and Emergencies Permanent Commission within the Council of Ministers. The Civil Protection Department is responsible for the development of the National Emergency Plan in Radiological Emergency in NPP and for approval of the Kozloduy NPP Emergency Plan. Stations for monitoring and notification of the Civil Protection authorities are established on the basis of the on duty regional and municipal councils. Thirty of the total 335 are equipped with highly sensitive apparatus for gamma-background measurement. Based on the data obtained a daily report is prepared on the status of the radiation situation. Additionally there are 5 stations in the emergency planning zone of the Kozloduy NPP (30 km). The gamma-background is measured 3 times per day at the rest of the stations located in the country. The data are reported to the Civil Protection Directorate and then to the Emergency Response Centre of the CUAEPP.

### **3. National Nuclear Safety Legislation**

The Constitution of the Republic of Bulgaria defines obligation for fulfilment of international commitments. According Article 5, Paragraph 4, international agreements ratified, promulgated and entered into force for the Republic of Bulgaria, are part of the Internal Legislation (namely, they have obligatory force as a national law) and have priority against internal legal regulations if they contradict them. Bulgaria has ratified the international conventions that directly regulate the use of nuclear energy and signed bilateral agreements on common interests in nuclear safety with Greece, Turkey, Romania, Russian Federation, as follow:

1 Treaty on the Non-proliferation of Nuclear Weapons (ratified on 10 August 1969, entry into force for the Republic of Bulgaria on 5 March 1970);

2 Agreement Between the Republic of Bulgaria and the IAEA for the Application of Safeguards in connection with the Treaty on the Non-proliferation of Nuclear Weapons (entry into force for the Republic of Bulgaria on 29 February 1972);

3 Vienna Convention on Civil Liability for Nuclear Damage (CCLND, ratified on 26 August 1994, entry into force for the Republic of Bulgaria on 24 November 1994);

4 1979 Convention on the Physical Protection of Nuclear Material (CPPNM, ratified on 30 December 1987);

5 1986 Convention on Early Notification of a Nuclear Accident (CENNA, ratified on 30 December 1987);

6 1986 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (CANARE, ratified on 30 December 1987);

7 1994 Convention on Nuclear Safety (CNS, ratified on 14 September 1995);

8 Agreement on the Privileges and Immunities of the International Atomic Energy Agency (ratified on 12 January 1994);

9 Agreement between the Government of the Republic of Bulgaria and the Government of the Republic of Greece on Early Notification of a Nuclear Accident and Exchange of Information on Nuclear Facilities (adopted by the Bulgarian Council of Ministers on 23 October 1989);

10 Agreement between the Government of the Republic of Bulgaria and the Government of the Republic of Romania on Early Notification of a Nuclear Accident and Exchange of Information on Nuclear Facilities (ratified on 25 September 1997, entry into force on 1 January 1998);

11 Agreement between the Government of the Republic of Bulgaria and the Government of the Republic of Turkey on Early Notification of a Nuclear Accident and Exchange of Information on Nuclear Facilities (ratified on 28 January 1998, entry into force on 21 May 1998);

12 Agreement for Co-operation between the CUAEPP to the Council of Ministers of the Republic of Bulgaria and the Federal Supervision on Nuclear and Radiation Safety of the Russian Federation (approved by the Bulgarian Council of Ministers on 11 March 1996);

13 Agreement for Co-operation between the CUAEPP to the Council of Ministers of the Republic of Bulgaria and the Ministry of Environment and Nuclear Safety of the Ukraine (approved by the Bulgarian Council of Ministers on 20 March 1998);

14 Agreement between the Government of the Republic of Bulgaria and the Government of the Russian Federation for Co-operation in the Field of Peaceful Use of Atomic Energy (approved by the Council of Ministers on 6 September 1995);

15 Agreement for Co-operation between the CUAEPP to the Council of Ministers of the Republic of Bulgaria and the Federal Ministry of Natural Environment, Nature Protection and Reactor Safety of the Federal Republic of Germany (approved by the Council of Ministers on 25 May 1992);

16 Protocol Additional to the Agreement between the Republic of Bulgaria and the International Atomic Energy Agency for Application of Safeguards on the Treaty on Non-proliferation of Nuclear Weapons (signed on 24 September 1998).

17 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (signed on 24 September 1998).

At present Bulgaria is in a process of approximation of the national legislation to that of the EC. The CUAEPP is the organisation responsible for the implementation of the National Program for Adoption of 'Acquis Communautaire' in the field of nuclear safety. The Program reviewing and upgrading Nuclear Safety Legislation is being implemented. The Atomic Energy Act is under review looking forward to establish advanced inter-relations in the nuclear field as well as to consider the provisions of the new State Administration Act. There are other regulations issued by different government organisations dealing with use atomic energy and especially radiation protection, all of which should be updated. An Act on Public Radiation Protection is to be developed.

### ***Act on the Use of Atomic Energy for Peaceful Purposes***

The Act on the Use of Atomic Energy for Peaceful Purposes (AUAEPP) has been in force since 1985. The Act arranges the fundamental public relations in the field of atomic energy utilisation. In 1994 the CUAEPP proposed to the Council of Ministers a project Act (bill) for amendment and supplement of the AUAEPP, which was approved in 1995. The undergone demonopolisation and decentralisation, liquidation of planned economy, and development of market economy, requiring alterations in the management and control system in the field of atomic energy utilisation, demanded the proposition of such a bill.

**In Chapter I** of the Act - "General Provisions" - the fundamental principles for atomic energy utilisation are included:

- 1 atomic energy in the Republic of Bulgaria is used for peaceful purposes only;
- 2 atomic energy utilisation for production of nuclear weapons or other nuclear explosive facilities, as well as any other means of mass destruction, is prohibited;
- 3 special nuclear material and nuclear facilities are exclusively state property;
- 4 priority to safety when using atomic energy.

**In Chapter II** of the Act - "Management of Atomic Energy Utilisation" - the CUAEPP is delegated as a State body, pursuing the governmental policy of safe utilisation of atomic energy. The Functions of the CUAEPP are defined in Article 13 of the Act.

**In Chapter III** of the Act - "State Control" - the fundamental rules for exercising the State control over the safe atomic energy utilisation and nuclear material transportation, storage and accounting, are contained. The State Control is carried out by the CUAEPP through the ISUAE.

ISUAE basic legal right is to issue permits for carrying out activities on atomic energy utilisation. Such permits are required for all activities enumerated in Article 23 of the Act. The licensing process is not a single act, but follows the processes of siting, commissioning, construction, operation and decommissioning of a nuclear facility.

The orders in **Chapter IV** of the Act - "Civil Liability" - are in compliance with the Republic of Bulgaria's obligations, under the "Vienna Convention on Civil Liability for Nuclear Damage".

In Chapter V of the Act - "Administrative-criminal Orders" - pains and penalties, for non-observance of act determined responsibilities, are stipulated. The recent amendment of this chapter aims correction of the penalties in accordance with the undergone inflation.

The AUAEPP creates a new part in the Criminal Code of the Republic of Bulgaria - "Utilisation of Atomic Energy for Peaceful Purposes Felonies (Offenses)". For acts, which are offenses under this part of the Criminal Code, punishments under the force of the code are imposed. Additional provisions of AUAEPP assign legal definitions to some fundamental terms in the field of atomic energy utilisation.

The amendment of the AUAEPP is under discussion. It is part of the measures for strengthening of the regulatory body, which implementation should secure its functional independence.

#### ***Act on Use of Atomic Energy for Peaceful Purposes Enforcement Regulations***

The AUAEPPER gives interpretation of the meaning of the AUAEPP. In connection with the AUAEPP adopted amendments, a new draft version on the AUAEPPER is discussed.

***Regulation No. 2 on Cases of and Procedures for Notifying the CUAEPP on Nuclear Safety and Radiation Protection Related Operational Variations, Occurrences and Emergency Situations***

This regulation specifies the cases of and procedures for notifying the CUAEPP on safety related events, during management, operation or use of nuclear material, nuclear facility, radioactive substances or any other ionising radiation sources. Time limit and procedures for the CUAEPP notifying and event reporting forms are determined. The borne responsibility of non-notification and late, inaccurate or insufficient notification on safety related event is specified.

***Regulation No. 3 on Nuclear Power Plants Safety Assurance, During Design, Construction and Operation Stages***

As written in the regulation, a NPP is assumed as safe, if by means of technical aids and management precautions, non-exceeding of personnel and public dose limits, and environmental contamination limits, are ensured, during normal operation and design basis accidents. The regulation contains, management and technical requirements, which execution is necessary for NPP safety assurance, during design, constructional and operational stages. This regulation will be revised in 2000 and will look after meeting the enhanced international safety requirements for existing, under construction and under design NPPs and including additional requirement in the contents of NPP decommissioning project.

***Regulation No. 4 on Nuclear Material Accounting, Storage and Transportation***

This regulation specifies the way of and procedures for nuclear material accounting, storage and transportation. The fundamental principles of the physical protection of nuclear material are determined, during utilisation, storage and transportation (the State has the monopoly of the nuclear material extraction, reprocessing and production, special nuclear material transportation and trade, and nuclear facilities use). The regulation is not in force for materials obtained from ore extraction and reprocessing, in the Republic of Bulgaria. This regulation will be revised in the 1999-2000 period.

***Regulation No. 5 on Utilisation of Atomic Energy Licenses Issuance***

This regulation specifies the necessary documentation, terms, procedures and time limits for issuance of licenses for atomic energy utilisation. Permits for atomic energy utilisation, are issued by the ISUAE, after receiving applicant's request in written form. The request should be accompanied by the necessary for giving a permit, documentation determined by this and other atomic energy utilisation regulation.

The present licensing system allows for a good control of the safety related modifications. This has been demonstrated during the upgrading of the Kozloduy units 1-4, whereby also the 2+2 approach was satisfactorily implemented. This regulation will be revised in the 1999-2000 period, aiming more precise definition of the licensing procedures and documentation requested from the applicant and more complete determination of decommissioning process of NPP and other sources of ionising radiation.

***Regulation No. 6 on Criteria and Requirements for Training, Qualification and Capacity of Atomic Energy Field Employed Personnel***

This regulation specifies the criteria and requirements for training, qualification and capacity, of atomic energy field employed personnel. It has the purpose of gaining, keeping up and enhancement of personnel professional qualification, and ensuring of necessary capacity for safe atomic energy utilisation. This regulation will be revised in the 1999.

***Regulation No. 7 on Radioactive Wastes Collection, Storage, Reprocessing, Deposition and Repository, on the Territory of the Republic of Bulgaria***

This regulation specifies the terms and procedures for collection, storage, reprocessing, deposition, transportation and repository of RAW by the producing organisations. It is not in force for spent fuel and spent fuel reprocessing wastes. It prohibits the import and transportation of RAW produced the country, on the territory of the Republic of Bulgaria. This regulation will be revised in the 2000 period, aiming ultimate compliance with the new requirements of the in force AUAEPP and AUAEPPER.

***Regulation No. 8 on Nuclear Facilities and Nuclear Material Physical Protection***

This regulation, specifies the fundamental principles, of nuclear facilities and nuclear material physical protection. It includes the organisational and technical requirements for ensuring nuclear facilities and nuclear material physical protection, during utilisation, storage and transportation. The regulation has a direct bearing on all physical persons and organisations, that design, construct, use, commission or decommission nuclear facilities, and produce, store, use, import, export and transport nuclear material or ensure it physical protection. Actualisation of this regulation is foreseen.

***Basic Standards for Radiation Protection***

The purposes of the Standards are to ensure protection of the human being from the injurious influence of ionising radiation, without disturbance of the beneficial utilisation process. They are based on Publication No. 26 of the International Commission on Radiological Protection (ICRP) and Basic Safety Standards of the IAEA from 1982. They determine the irradiated persons' categories and effective dose control and derivative limits. They are obligatory for all physical persons and legal entities, which exercise activities with concerning public and personnel irradiation, sources of ionising radiation. At present time new Basic Safety Standards for Radiation Protection (BSSRP-2000) are in process of developing in compliance with IBSS-1996 and the Directive of the European Union 96/29/ Euroatom, which are expected to be put in practice till the middle of 2000.

***Regulation on Planning and Preparedness for Action in Case of a Radiation Accident***

This regulation determines the common duties of the state bodies and the bodies of the local administration and local self-government in the framework of their competency. It defines the updated criteria for definition of the different protective measures (shelter, evacuation, iodine prophylactics, etc.) for the population in case of a radiation accident. The criteria used in the decision making are based on the avertable dose. Criteria for seizure and substitution of radioactively contaminated foodstuffs and drinking water are also defined in addition to the dose criteria. The criteria are applied to foodstuffs as they

are consumed and are related to the middle and late stage of the accident. It was approved in the beginning of April 1999.

***Ministry of Health and Ministry of Internal Affairs - Regulation No. 0-35 on Work with Radioactive Substances and Other Sources of Ionising Radiation***

This regulation is developed on the basis of the Public Health Act and determines the basic requirements for radiation safety assurance. It includes a complex of protective measures for dose equivalent reduction, for different categories of persons and critical organs.

***Ministry of Health and CUAEPP - Regulation No. 46 on Transport of Radioactive Substances***

It regulates the air, road and water transport of radioactive substances. Its purpose is to prevent or reduce, and control the irradiation and radioactive contamination of public, animals and other environmental objects, during transportation of radioactive substances.

## **4. Regulatory Body Status**

### **4.1. Safety policy of the CUAEPP**

CUAEPP is a State Body and its personnel, including its Chairman, his deputies and Managers are determined by the Council of Ministers. The Chairman of the CUAEPP reports to the Deputy Prime Minister, who is responsible for the co-ordination of the activities in the energy sector. The CUAEPP is a legal entity with its own budget and implements its activities with the help of an administration.

CUAEPP pursues the state policy on the safe use of atomic energy. This policy is defined by the AUAEPP, other acts of the National Assembly, the normative acts of the Council of Ministers and the acts of the CUAEPP. According to the AUAEPP the basic principle of the safety policy of CUAEPP is PRIORITY TO SAFETY when using atomic energy, including nuclear power. The primary safety objective of CUAEPP is to ensure that the personnel, the public and the environment are protected from possible adverse effects arising from NPPs. CUAEPP is responsible for assessing the safety level of the NPP operation and for informing the Government and the public about its assessment.

This policy is implemented by the CUAEPP through the following activities:

- determining the requirements for safe use of atomic energy and the procedure for accounting for, storage and transportation of the nuclear material;
- determining the criteria and requirements for training, qualification and licensing of the work force involved in the use of atomic energy;
- analysing and inspecting all the activities;
- issuing licenses on the use of atomic energy;
- supervision of the licensed activities;
- implementing the international cooperation;
- informing the public.

The activities of the CUAEPP as a Regulatory Body cover all functional areas, including regulatory control, independent assessment and inspection of the implementation by the operating organisation of the obligations concerning the safety management.

## **4.2. Functions of CUAEPP**

The basic law regulating the use of nuclear energy in the Republic of Bulgaria is the Act on the Use of Atomic Energy for Peaceful Purposes (AUAEPP), promulgated by the National Assembly (Parliament) on 7 October 1985, as supplemented and amended in September 1995. The main document for application of the AUAEPP is the AUAEPP Enforcement Regulations (AUAEPPER), promulgated on 22 August 1986. According to the law, the CUAEPP:

- 1 Participates in the elaboration of concepts and programmes, co-ordinates and finances research and development in the field of atomic energy;
- 2 Determines the requirements for the safe use of atomic energy and accountancy for the storage and transportation of nuclear material;
- 3 Determines the criteria and the requirements on training, qualification and licensing of the personnel working in the field of atomic energy;
- 4 Collects and submits information to the relevant authorities about events related to the nuclear safety and radiation protection;
- 5 Co-ordinates the control of the safe use of atomic energy;
- 6 Determines the measures and directs the restoration of any sections of the environment affected by radioactive sources;
- 7 Implements the international co-operation of the Republic of Bulgaria in the field of atomic energy and participates in the activities of international organisations in this area.

## **4.3. CUAEPP independence**

The independence of CUAEPP finds expression in the legislative provisions of the AUAEPP in reference of;

- the right to issue safety regulations;
- the right to issue licenses and to stop their validity (to withdraw the license, for example in case of violation of license condition);
- the right to carry out regulatory inspections;
- the right to issue prescriptions for corrective measures obligatory for implementation, including unit shutdown in case of serious violation, for example violation of the limits and conditions for operation;

- the right of undertake enforcement measures - sanctions in the form of fines to physical persons, who have committed violations as defined by the Law (for example non-fulfilment of a prescription), as well as to the legal entities.

The CUAEPP is functionally, financially and legally independent from the applicant/licence holder and from organisations promoting nuclear energy and implementing the state policy on the use of atomic energy. The decisions of such organisations are not obligatory for the CUAEPP. The administrative acts, decisions and resolutions of the CUAEPP and its bodies issued within the framework of their competency are obligatory for all ministries, other authorities, including plant operator, organisations and persons. Litigation of the administrative acts issued by the CUAEPP could be done through the court. The Council of Ministers has the right to countermand a CUAEPP administrative act only if it is illegitimate or irregular.

By a Protocol Resolution of the Council of Ministers dated 1 April 1999 a Report of the CUAEPP Chairman on the measures for strengthening of the Regulatory Body including increase of the inspector salaries was adopted.

As an authority, the CUAEPP has its own budget that is a separate part of the budget of the Council of Ministers. It is formed by annual contributions from the state budget and the established taxes for licensing of atomic energy activities. 40 % of the income from licensing taxes are used for providing for the necessary equipment, including the maintenance and operational expense and for motivation of the CUAEPP staff. Staff salaries are determined by the general principles of forming the overtime payment of the organisations on budget financing. The level of the average nominal salary is annually approved by a Governmental act. From 1 January 1998, the amount of allocated funds for additional financial motivation is increased from 5 to 8 percent, while the motivation is limited to 50 % from the earned nominal salary. From 1 October 1998 through amendment in this Regulation, the possibilities of additional financial motivation depending on the functions and the level of responsibility are significantly increased. It is within the range 120 to 180 percent of the nominal salary. By a Protocol Resolution of the Council of Ministers dated 1 April 1999, the amount of allocated funds for additional financial motivation was increased from 8 to 11 percent. For this year salaries in the CUAEPP are about 25 % higher than the average one for those employed in activities financed by the budget.

From the point of view of financial independence, a mechanism for long-term financing of the regulatory body is under consideration. The discussed measures are legislative in nature.

#### **4.4. Organisational structure of CUAEPP**

A Chairman governs CUAEPP, supported by: Deputy Chairman responsible for the international co-operation, European integration and quality assurance, co-ordination of science and technology development and the communications; Deputy Chairman responsible for the control and licensing activities on the safe use of atomic energy and the emergency planning and preparedness; Executive Secretary responsible for the administrative support; Legal Division; Representative of the CUAEPP in IAEA.

Two Advisory Councils are established to the CUAEPP: Council on Safety of Nuclear Facilities and Council on Radiation Protection. The Councils are permanent and assist the Chairman of the CUAEPP on key issues in this area. Their members are famous scientists and specialists in the use of atomic energy and are personally appointed by a Decree of the Council of Ministers. The functions, tasks and working procedures of the Councils are defined by an approved rule. During 1998 there were 15 sessions of the above mentioned Advisory Councils.

The organisational structure of the CUAEPP is shown in Figure 1. At present time the permanent CUAEPP staff (full time) is 74 persons. According to the Protocol Resolution of the Council of Ministers dated 1 April, there will be stage-by stage increase of the CUAEPP staff. From the beginning of July 1999 the staff number is increased to 88 people. The target for 2001 is about 110 persons.

The Chairman reports directly to the Council of Ministers. CUAEPP also issues an annual report that is distributed among the National Assembly, all governmental authorities and public organisations. According to the 01.04.1999 decision of the Government, the Chairman twice a year has to prepare and to present a report to the Council of Ministers on the safety aspects of the NPP "Kozloduy" operation, as well as on the radiation protection issues. The CUAEPP prepares and presents after an approval by the Council of Ministers the report of the Republic of Bulgaria to the IAEA General Conference.

#### The Inspectorate on the Safe Use of Atomic Energy:

- 1 Exercises control over all physical and legal entities for compliance with the established requirements on the safe use of atomic energy and on accounting, storage and transportation of nuclear material and radioactive substances;
- 2 Issues licenses for activities in the field of atomic energy use;
- 3 Conducts joint control with other specialised regulatory bodies on the safe use of atomic energy;
- 4 Register of sources of ionising radiation;
- 5 Commissions studies, research, expertise and other activities connected with its control activities.

At present time the ISUAE has 45 employees - 22 nuclear safety inspectors, 13 radiation protection experts and 2 secretaries at the headquarters in Sofia and 8 inspectors at the Kozloduy site. The inspectors have the right to require implementation of any measures to prevent violation of the law or normative act on its enforcement that establishes safety requirements.

After a new normative act determining higher safety requirements comes into force, the responsible organisation is obliged to conduct reassessment of safety and to propose measure in order to put the nuclear facility in compliance with the new requirements. The proposed measures are to be co-ordinated with the CUAEPP.

## Nuclear Safety Inspectors

working experience	0 - 5 years	6 - 10 years	11 - 15 years	16 - 20 years	over 20 years
in ISUAE	10	4	5	3	
in NPP	9	10	2	1	
in R&D	13	3	2	4	
Total	1	2	2	7	10

During 97-98 the guidelines for work and job description of the personnel were revised and updated. The Emergency Response Center activity was strengthened. Computerized database for output correspondence was implemented. The computer network was expanded and was improved in quality. In the end of April 1999 the number of personal computers in CUAEPP is 57, from these 26 units with installed Windows NT. New software was introduced including the APIS program for state regulations. A computer reference book for inspectors assistance was introduced. The forms for different CUAEPP acts were updated. A system for presence control and working discipline was introduced. A system for monthly planning and job accountancy was introduced too.

Training courses for re-qualification of the personnel on radiation protection and dosimetry, English, computer skills and regulations implementation were carried out. The associated plans and procedures for staff training and examination have to be improved.

### **5. Evaluation of CUAEPP organisation and responsibilities**

#### ***PHARE Exploratory Mission in 1992***

This was the first mission which examined the status and needs of the CUAEPP. The next important step in this direction was the invitation of International Regulatory Review Team (IRRT) mission to Bulgaria in 1993.

#### ***IRRT Mission in 1993***

An IAEA team of experts visited the Bulgarian Committee on the Use of Atomic Energy for Peaceful Purposes in Sofia from 2nd until 6th August, 1993. The scope of the review included: Government organisation and nuclear legislation; role and responsibility of the regulatory body; organisation of the regulatory body and regulatory inspection and enforcement. A thorough exchange of regulatory experience and practices was achieved throughout the period of the review.

In the opinion of the review team the basic organisation and structures to regulate nuclear power in Bulgaria are in place including a nucleus of competent and dedicated staff. The recommendations were related to further improvements aiming at enhancement of regulatory body's effectiveness, particularly taking into account:

- The increasing work load associated with the upgrade and backfiring of the four older NPP units;
- The bringing up to full power operation of the two newer units at Kozloduy NPP;
- Developing and maintaining in long-term a safety culture appropriate to the use of nuclear energy.

The experts of the mission identified a lot of progress in the development of the structure, organisation and regulatory working practices of the CUAEPP since its creation. This progress is considered to be a good basis for its further development as a strong regulatory body. The major recommendations of the mission stressed upon the necessary conditions for the development of the CUAEPP into a regulatory body comparable to good international practice. The implementation of the recommendations was discussed during the IRRT mission carried out in 1997.

### **IRRT Mission in 1997**

An IAEA Team of Experts visited the Bulgarian Committee on the Use of Atomic Energy for Peaceful Purposes from 10th until 14th November, 1997. The scope of the review was in the following specific areas: role and responsibility of the regulatory body; organisation of the regulatory body; regulations and guides; licensing process; requirements on the applicant/licensee; review and assessment during the licensing process; regulatory inspection and enforcement and radiation protection. Some areas were not reviewed in details because of the limited time available and because progress had clearly been made since the previous IRRT Mission conducted in 1993.

In the opinion of the review team the basic organisation and structures to regulate nuclear power in Bulgaria are in place, including a core of competent and dedicated staff. The need to provide adequate resources to the regulatory body was identified. The recommendations concerning the resources were made in relation to the inspection, safety assessment and radiation protection.

As indicated in the recommendations made, the concern has several related elements: provision of an adequate budget; need to establish staff with full range of competencies required to discharge the allocated responsibilities; recruitment and retention of competent and experienced staff; training of staff and provision of adequate salaries.

It was concluded that without urgent action in this area many of the improvements introduced in the recent years could be undermined to the detriment of nuclear safety.

The following priorities with the most significant impact on the nuclear and radiation safety were also identified as follows:

1The importance of strengthening the independence of the Regulatory Body and maintaining its authority;

2The need of making proper preparations for the introduction of a less prescriptive approach of regulation; and

3The need of strengthening the safety evaluation system on spent fuel storage and radioactive waste management facilities.

A plan for the fulfilment of the IRRT Mission recommendations and suggestions was prepared and approved by the Chairman of the CUAEPP.

## **6. Future status and tasks of the CUAEPP**

The present status of CUAEPP assures its independence, which finds expression in the legislative provisions of the AUAEPP. CUAEPP has the right of to issue licenses, the right to stop their validity (to withdraw the license), the right to issue prescriptions obligatory for implementation and the right of undertake enforcement measures.

Currently the AUAEPP assigns to the CUAEPP some functions of promoting nuclear energy, such as: Development of concepts and programs in order nuclear safety and radiation protection requirements to be taken into consideration already at the development stage; Financing researches and developments related to enhancement of nuclear safety and radiation protection, improvement of the implementation of radiation technologies in medicine, ecology, agriculture, etc.

Within the ongoing structural reform of the State Administration, in pursuance of the Administration Act, and the provisions of the Convention on Nuclear Safety, the Council of Ministers of the Republic of Bulgaria has approved a set of measures for restructuring and further strengthening of the Bulgarian Regulatory Body. Some of the major measures foreseen are:

- Transformation of CUAEPP and its administration into State Agency of Atomic Energy to the Council of Ministers. That change aims at CUAEPP to review the national nuclear program, instead of functions to promote use of nuclear power;
- Within the new structure of the Regulatory Body as a State Agency there will be no collective body similar to the existing State Committee;
- Stage-by-stage increase of CUAEPP staff, while for 1999 with 14 employees;
- Increase of the nominal salaries of CUAEPP employees. Taking into account the specific nature and the high level of responsibility, a special regulation determines a way for additional financial motivation of CUAEPP managers and specialists by using part of the funds collected from fees and fines under the AUAEPP.
- Further financial improvements for strengthening of CUAEPP. Currently CUAEPP is legal entity on budget funding. In addition it receives funds, coming from collection of fees for licensing, information and expert services, etc., as well as fines.
- Amendment of the AUAEPP. Amendment of the AUAEPP is under discussion that will limit CUAEPP functions to regulation and supervision of nuclear safety and

radiation protection and co-ordination of the international co-operation in these areas. The following changes are foreseen:

- Harmonisation of the Act with the Convention on Nuclear Safety, the Convention on the Physical Protection of Nuclear Material and the Vienna Convention on Civil Liability for Nuclear Damage;
- More precise definition of Regulatory Body functions on the State control over nuclear safety and radiation protection;
- Change deriving from the transformation into State Agency;
- Establishment of stable legislative mechanism for overall funding of the State Agency, including funding of researches and expertise connected with the licensing and supervision activities; etc.

All measures are dedicated towards providing sufficient financial and human resources to the regulatory body for the fulfilment of its duties. These duties are related to execution of inspections, assessment of the state of the nuclear facilities, issuance of permits and licenses, implementation of researches, etc., as well as to cover membership dues to international organisations in which the country participates.

## **7. Inspection and enforcement**

### **7.1. Basis Establishing the System of Regulatory Inspections**

According the regulations of Article 7 and Article 13 Paragraph 1 of AUAEPP, the CUAEPP exercises the Governmental nuclear safety control and defines the requirements on safe use of atomic energy. According Article 18 of the same Act, the ISUAE exercises the control over keeping these requirements.

The Regulatory body establishes and implements a systematic and planned inspection programme, which adequately covers all areas of regulatory concern during the different stages of the lifetime of the nuclear facility.

The specific responsibilities and legal authority of the nuclear safety inspectors are defined in the AUAEPP and the Rules for its implementation. The Regulatory Body exercises control of nuclear facilities at all licensing stages.

In order, to systematically verify licensee compliance with the safety requirements and objectives and to identify potential safety problems, an inspection plan is developed annually on the basis of: proposals of the inspectors; proposals of other control authorities; regulatory information and data on potential safety problems; international and internal operational experience; available human resources at the Inspectorate, etc.

The Directive on the inspection activities regulates the organisation of the inspections to be carried out in the nuclear facilities as well as the acts, which should be issued. The Directive determines the following types of inspections: Routine inspections; Topical inspections; Complex inspections; Extraordinary (reactive) inspections.

### ***Routine Inspections***

Routine inspections are performed on day-to-day basis by conducting selective examinations with the goal of sampling all areas with a frequency appropriate to their safety significance. These inspections emphasise observation and evaluation of on-going safety activities to assess the effectiveness of the licensee performance to the maximum extent practicable through: Direct observation of safety significant activities and equipment; Tours of the facility; Interviews and discussions with licensee personnel; Independent verification of safety system status; Independent verification of operational limits and conditions; Review of facility records, etc.

These inspections are performed mainly by the on-site inspectors or with participation of inspectors from the Central Office according separate instruction. Usually the senior on-site inspector attends the licensee's management meeting to determine overall status of the plant and identify the daily safety significant activities.

### ***Topical Inspections***

The topical inspections are carried out in compliance with the Annual plan for the CUA EPP control activities. Topical inspections cover all inspection areas to verify licensee compliance with the current safety requirements, prescriptions, license conditions and to control licensee's management effectiveness in discharging its responsibilities in the relevant topic.

### ***Complex Inspections***

Complex inspections are to be performed by a team of inspectors in different safety areas. They are multidisciplinary, various in scope and complexity and provide an independent, in-depth and balanced assessment of licensee performance and preparedness for implementation of safety significant activities. An important element of this kind of inspection is to discuss the technical problems with the persons who are directly responsible for them. Typical examples are the inspections of unit's preparedness for start-up and operation after annual planned maintenance and refuelling and unit's preparedness for shut down for annual planned maintenance and refuelling. The complex inspections are planned and carried out following an initially elaborated programme.

### ***Reactive (Extraordinary) Inspections***

Reactive inspections are usually initiated in response to unexpected, unplanned or unusual situation or event occurring at the particular nuclear facility or as a response to a generic problem communicated from international experience or identified by the review and assessment staff of the Regulatory body.

The Head of the Inspectorate or his Deputy is kept informed about any significant event at the nuclear facilities. Does an important incident occur and if decided by the Inspectorate management, a fully independent investigation of the event is conducted.

### *Inspection of safety modifications*

All modifications, which may have an influence on nuclear safety, are subject of inspection. Depending on the scope and safety significance, modifications are inspected during complex inspections or a separate topical inspection is initiated.

Such inspections are preceded by analysis of modifications' safety justification and are licensed by the Regulatory Body. Subjects of these inspections are the implementation of the modification as well as its compliance with the design and license conditions.

The Directive on the inspection activity and the Directive for implementation of the operative control by the ISUAE - Kozloduy foresee accounting of the results and analysing of the inspection activities. The aim is to improve the control activities and to enhance the nuclear safety and radiation protection in the controlled sites.

According to the established practice, representatives from the specialised control bodies take part in the inspections when the subject and the range of the inspections require it. In compliance with the Annual plan for control activities the specialised control bodies also carry out inspections of the nuclear facilities independently.

The results of the inspections and the control exercised by the ISUAE and the specialised bodies are presented in the Annual Report of the CUAEPP which is submitted to the Council of Ministers, other State authorities, non-governmental organisations and the public.

## **7.2. Basis for enforcement**

The implementation of the normative acts in the field of nuclear safety is also ensured by sanctions - administrative, sanctions and penalties for committed offences. Acts for ascertainment of offences and penal enactment are issued for committed offences in the field of the safe use of atomic energy, which are personal administrative penalties according to Article 2 of the Act on Administrative Prosecution. Offences are ascertained by acts, issued by the control inspectors according the procedures of the Act on Administrative Offences and Penalties (AAOP).

Penal enactment is issued by the Chairman of the CUAEPP or by the Managers of the relevant bodies which have specialised control units or empowered by them officials. The penal enactment imposes administrative sanctions - penalties as provided by the AUAEPP. Chapter V of the AUAEPP specifies different in amount fines depending on the type of the offence and of the offender.

The ascertainment of the offence, the issuing, the appealing and the execution of the penal enactment are carried out under the procedures of the AAOP. The AUAEPP, as a special act, determines the body empowered to impose penalty as well as the types of the penalties and the extent of the administrative penalties, which could be imposed.

When it is established that the action is a criminal offence, the established administrative-punitive legal procedure is to be stopped and a prosecution proceeding is to be initiated.

Besides the acts for administrative offences and enactment for administrative penalties other personal administrative acts are issued: licence for exercising activities related to the use of atomic energy; order for revoking, amending or stopping of the term of licence; act for inspection of nuclear facilities and other sites with sources of ionising radiation; prescription.

The exercising of activities without licence or in deviation of the licence's conditions represents an offence according to the Penal Code (PC). The issued licences could be revoked, amended or withdrawn temporarily by an order of the Head of the ISUAE. The order of the Head of the ISUAE could be appealed to the Chairman of the CUAEPP within 7 days of the notification.

Inspectors on the basis of the inspection aimed at preventing or eliminating infringement issue obligatory prescriptions. The prescriptions are given to the managers or to the empowered competent representatives of the licensee. These persons notify duly the control inspector for implementation of the prescription. Prescriptions could be appealed to the Head of the ISUAE who issues an order. The order could be appealed to the Chairman of the CUAEPP. Non-implementation of a prescription is an administrative offence which is ascertained by an act for offence. On this basis the body empowered could issue a punitive enactment and could impose some of the penalties provided for in the AUAEPP.

### **7.3. Intensification of Inspections**

From the second half of 1997, the regulatory control over the nuclear facilities is being intensified. Due to the limited number of inspectors at the site, it was decided to accomplish this task by sending inspectors from the headquarters. Main types of inspections performed are as follows: Inspection of the preparedness of the nuclear facility for planned annual maintenance and refuelling; Inspection of the preparedness of the nuclear facility for start-up and operation; Operative control at the Kozloduy NPP site; Topical inspections and extraordinary (reactive) inspections.

The conducted topical inspections at the Kozloduy NPP site in 1998 are in the following areas: radiation protection; tests, surveillance and maintenance at the sealed compartments of units 1-6; Quality Assurance Programmes; Topical inspection of the training programmes and training facilities;

The following extraordinary inspections were conducted: investigation of the causes of chemical contamination of the Emergency Feedwater Tank at unit 1; investigation of the causes of increase in the radiation background at the site of units 1-4, during transportation of radioactive materials; investigation of the causes, development and operators actions in mitigation the consequences of an event with degradation of the secondary water chemistry of unit 3;

In conducting topical and extraordinary inspections during 1998 totally 450 man-days were invested.

As a result of the inspections carried out at the Kozloduy NPP site in 1998 65 safety improvement measures have been prescribed in the field of radiation protection. Totally 144 improvement measures have been prescribed in the following major areas: instructions and procedures, aiming at improving their compliance with plant status and established practices; additional analyses of some plant postulated accidents; improvement of the organisation and management of maintenance personnel; procedures for allocation of responsibilities and the interactions between the different divisions; additional procedures for specific tasks and activities; additional requirements to some safety important systems and parameters; acceptance and limiting criteria of specific equipment; requirements for replacement of existing equipment; etc.

## **8. Assessment and Licensing**

### **8.1 Basic system for licensing**

The licensing of nuclear facilities by the ISUAE is based on the review and assessment of the safety documentation submitted by the Operator. According to the AUAEPP all nuclear activities require a licence. Licences are issued for:

- siting, design, construction, commissioning, operation and decommissioning of nuclear installations as well as other sites with sources of ionising radiation;
- production of equipment, design and structural modifications, delivery of equipment and other services, which concern the safety;
- ownership, production, import, export, trade, storage and transportation of nuclear material and radioactive wastes.

For each stage of the licensing process different part of the SAR should be presented. The SAR requirements (licence conditions) for each different stage of the licensing process are described in an Ordinance of CUAEPP. A Final (Pre-operational) SAR based on the construction, pre-operational adjustments and complex test results is presented for licensing of the final commissioning stage. For review of the contents of the SAR, a team of highly experienced experts in every area has been established. Every expert assesses the presented documentation in his/her speciality area and issues a written statement.

All safety related activities should be carried out after receiving a licence from the ISUAE. Safety upgrades and backfitings also require license from the ISUAE. Some modifications could be grouped and one licence issued or licences could be issued for each single modification. Separate kinds of modifications and upgrades could be exempted from licensing as determined by the normative acts.

If necessary, independent expert evaluation of the documentation is assigned to an outside organisation (TSO). The results of such kinds of evaluation are used in the same way as the ISUAE expert statements. For most important safety reviews, the ISUAE uses the help of international organisations. Many IAEA expert missions have been invited to review the operation, safety upgrading programmes, RAW repository, PSA analyses, as well as bilateral support by almost all West European regulators.

The ISUAE licence is a legal document, which:

- licenses the kind of activity using atomic energy according to the AUAEPP;
- specifies the requirements and the terms;
- sets the expiration date of the validity of the licence.

The applicant who uses or will use atomic energy applies for a licence by a request in written form. The licence contains basis for licence issuing, licensing authority, licensed activity, special and general requirements and conditions to be complied with by the applicant, list of documents, on which basis the licence is issued, relevance to other licences, name of the recipient of the licence, date of issuing and expiration date of the validity of the licence, responsibilities during the execution of the specified activity, etc.

The special requirements and conditions towards the applicant may refer to additional training of the personnel, extended maintenance, inspections, testing and check-ups, frequency of preventive technical service, submitting of additional information, strengthening of the requirements for coolant reactivity and other limits and conditions for safe operation, including reactor power capacity.

General requirements and conditions of the licence include indirect warning for observing the requirements of the normative acts related to the subject.

The CUAEPP Regulation No. 5 specifies the necessary documentation, terms, procedures and terms for the issuing of a licence. Chapter 2, 4 and 6 of this Regulation determine the necessary documentation to be submitted to the ISUAE for the issuing of a licence for activities related to nuclear facilities. If the normative acts require a licence or a consent permit of the specialised or other control bodies for exercising activities related to the use of atomic energy, the ISUAE issues a licence only when the consent permit of these bodies is available.

The ISUAE has adopted a practice to issue licences for NPP operation only for one fuel cycle.

Usually some special requirements and conditions towards the applicant refer to additional training of personnel, extended maintenance, inspections, testing and check-ups, frequency of preventive technical service, submission of additional information, etc.

During 1998 ISUAE issued 5 licences for annual repair and refueling of Kozloduy units and 7 licences for their operation.

## **8.2. Assessment of safety significant events**

During 1998 62 events at NPP "Kozloduy" connected with the nuclear safety and radiation protection were reported to the regulatory body and assessed. The reported events were assessed according to the scale INES as follows:

- 45 events are level "0" ("deviations"), which constitute 73 % of the total;
- 4 events are level "1" (anomaly), which constitute 6 % of the total;
- 1 event is level "2" (incident), which constitute 2 % of the total;
- 12 remaining events were classified as insignificant to the NPP safety or outside the scale, which constitute 19 % of the total.

The distribution of safety significant events among units is:

- unit 1 – 12 events, 1 is level 2, 2 are level 1, 5 are level 0;
- unit 2 – 5 events, 4 are level 0;
- unit 3 – 14 events, 1 is level 1, 12 are level 0;

- unit 4 – 10 events, 9 are level 0;
- unit 5 – 5 events, 4 are level 0;
- unit 6 – 13 events, 1 is level 1, 11 are level 0;
- plant systems – 3 events.

The most frequent consequences for the NPP operation are:

- reactor scram-43%;
- non operability of the safety systems channel-19%;
- load reduction - 19 %

The most frequent root cause for the events is equipment failure-65 % followed by the personnel error-26 % and errors in the procedures -5 %. The tendency from the previous years is preserved : the equipment failure continues to be a dominating factor as a root cause for the operational events. The in-depth analyses of the events show that 56 % of them include human error and 63 %- insufficient effectiveness or lack of procedures. A conclusion can be drawn that each of the events is connected with an equipment failure and some of them have occurred before due to insufficient effectiveness of the corrective measures.

During 1998 there were 3 events leading to the activation of the emergency scram system. Result of 6 events was unplanned exposure of the personnel, or radioactive contamination in the site. Totally in 35 % of the cases there was failure of the safety system's trains.

### **8.3. Assessment of safety modifications**

The licensee should demonstrate to the regulatory body that the design of modification and the subsequent change in operational procedures will contribute to the prevention of accidents and mitigation of their consequences. License is issued on the basis of comprehensive assessment and analysis of the provided relevant information including principles, criteria and standards and after the Regulatory body is fully convinced that the modification would not lead to undue radiological risk to the personnel and public.

The information provided by the licensee should be complete and comprehensive description of modifications significance, its role, functional and operating characteristics and design basis with sufficient detail so that the regulatory body can complete efficient review and assessment. If the information provided by the licensee do not meet these requirements, additional information could be required by the Regulatory body. Also codes and standards used in the modification design should be indicated and fully referenced as well as results of researches and expertise carried out for justification of design should be presented.

During 1998 ISUAE issued **68** licenses for modifications in the safety systems and in the safety related systems of Kozloduy units. Totally **155** permits were issued to the external companies for their participation in the repairs or modernization activities.

- **Complex Programme for reconstruction of units 1-4 of Kozloduy NPP**

After completion of the short-term programme, Kozloduy NPP presented to the Regulatory body for review a concept for reconstruction of units 1-4. It aims to guarantee units' safe operation by implementation of technical measures and to achieve compliance with the current regulatory requirements and safety standards. A joint team of leading Bulgarian and Russian design institutes and organisations together with Kozloduy NPP performed in-depth assessment for more than two years. This assessment came up with the conclusion that the Programme is consistent with the policy for systematic and continuous improvement of units' safety and with the internationally accepted criteria for safe operation of NPPs. The Regulatory body reviewed the programme and defined additional requirements for further improvement of the Programme. It distributed its official position of the Programme the utility and State authorities concerned, considering the Programme as unsatisfactory and open. Regulatory body has required further application of defence in-depth principle, justification of new maximum LOCA, justification of measures efficiency, prioritisation of implementation, development of safety analysis report, etc. After considering these requirements, a new version of the Programme was elaborated and submitted for approval.

In order to ensure broader basis for acceptance and implementation of the Programme, the Regulatory body undertook the following steps:

- Co-ordination between all state authorities concerned of the additional requirements related to radiation protection of the public;
- Requested assistance from leading western expert organisations to define an overall approach and set acceptance criteria;
- Requested expert Programme assessment from the IAEA;

The IAEA mission on the REGULATORY ASPECTS of the proposed program with 3 experts participating was accomplished in February 1999. The working meeting between experts from RISKAUDIT, Regulatory body and NPP "Kozloduy" took place during 10-12 05.1999. Nevertheless the Programme is open and in a process of approval, the Regulatory body supports the implementation of some safety improvement technical measures which do not require additional assessment and analysis.

- **Programme for modernisation of units 5 and 6 of Kozloduy NPP**

In 1998 started the implementation of main engineering phase of the Programme of modernisation of units 5 and 6. The objectives of this phase are to specify technical tasks and requirements for development of the design of planned upgrading and backfitting, as well as the necessary researches and analyses to be performed. Regulatory body conducts assessment of Programme tasks and measures. It is supported by experts from the Consortium of Western Regulators within the framework of the PHARE contract – Assistance to BNSA, safety assessment of Kozloduy units 5/6 and licensing of the related utility improvement programme including review of PSA. Due to delay in signing the contract with the European consortium – Kozloduy NPP, the assessment process continues.

- **External assessment**

ISUAE uses external consultants to intensify its assessment capabilities. During 1998 ISUAE has signed 12 contracts mainly using Bulgarian experts and organisations, and also under the PHARE Programme for external expertise in the following areas:

- Two-stage assessment of the PSA – level 1 study for Kozloduy NPP units 5 and 6 under PHARE Project;
- Assessment of additional emergency feedwater system – Riskaudit;
- Independent expertise on the thermal hydraulic analysis of LOCA Da 100, Da 200 and Da 500 mm – Enproconsult Ltd.;
- Independent expertise on analysis of radiological consequences of LOCA Da 100, Da 200 and Da 500 mm – Enproconsult Ltd.;
- Independent assessment of potential consequences for the steamgenerators from the event with secondary water chemistry degradation at unit 3, etc.

#### **8.4. Licenses for safety modifications**

All modifications of safety related systems have to be licensed by ISUAE. Modifications implemented at units 1-4 come out mainly from the Complex Programme, corrective measures based on the operating experience and the international feedback system. In 1998 ISUAE has issued 68 modification licenses. The more important ones are in the following areas: Axial power distribution in the core; DG station batteries; DG protections and interlocks; SG safety valves; Main control room venting system; Steam dump to the atmosphere system; Additional emergency feedwater system; Antiseismic strengthening of pipes and structures; Secondary circuit safety valves; SPDS; Fire fighting systems; Control rod drop time; Neutron flux monitoring system; Reactivity control; Reliability of power supply, etc.

#### **8.5. Producing and Review of Safety Analysis Report (SAR)**

The existing safety reports on the design of Kozloduy NPP units 1-4, prepared in the 70's and 80's are with a limited volume and do not correspond to some requirements for the demonstration of safety, applied in the western countries. During last years the operating organisation has made considerable efforts towards the improvement of the safety of the units, but this has not been done systematically.

In 1997 CUAEPP with the participation of RISKAUDIT under the PHARE/BG/TSO/05 Project, initiated the development of requirements for the format, content and structure of the Safety Substantiation Report (SSR). The project was finished in June 1998. Taking into account the fact that a lot of modifications had been implemented during the years of units operation, the ISUAE has issued a prescription that requires the development of updated SAR - SSR reflecting the actual safety case of the units in operation. The Requirements contain detailed advice towards the methodology of the assessment, safety justification and the structure and content of the report. The Kozloduy NPP has taken measures to perform

the first draft of the SSR for units 1-4. One part will be completed at the first half of 1999 and will include in systematic way all the information available from the safety analyses performed (in all stages, including design and modifications).

The final versions of the safety reports should be completed by mid 2001. The review of the SSRs will be performed by the ISUAE with the assistance of all TSOs. CUAEPP will appreciate any international support in the review process.

The following safety reports exist for the Kozloduy NPP units 5-6:

- Technical substantiation of safety (TSS) developed in designing the units;
- TSS for the reactor of WWER-1000/320 type reactor unit for Kozloduy NPP units 5-6;
- TSS, developed after commissioning, containing updated information.

A common deficiency of these documents is that they have been developed according to outdated normative requirements. A development of new reports for the technical substantiation of safety is envisaged, specific for each unit, after completion of the upgrading of these units and in accordance with the existing international practices in the developed countries. The CUAEPP Directive for Performing of Periodic and Systematic Assessment of the NPP in Operation contains detailed requirements on the conditions, order and terms of performing such an assessment. The structure and content of such report has been developed under the PHARE project and presented on the Fifth Annual Meeting of the Co-operation Forum of the WWER Regulators in Armenia - August 1998.

## **8.6. Qualification and Licensing of the NPP personnel**

Periodical inspections on the qualification of the Kozloduy NPP personnel were carried out, as well as of the system for staff training and re-qualification and the functioning of the Training center. During these inspections the preparedness of the units for start up and operation it is checked, whether the operative shifts are well staffed and if they are sufficient for ensuring the operation. The programs for getting familiar with the changes and upgrading of the systems and equipment have also been checked. The problems in the staff training are defined too, mainly in ensuring the operators' qualification on a full scale simulator.

The rules for state licensing of NPP staff were updated in 1997. Leading specialists and scientists from CUAEPP, Universities, Ministry of health and other organizations were selected to participate in the State Qualification Commission (SQC).

In 1997, 9 meetings of the SQC were held and 38 persons were examined. 35 of them have been licensed outright and 3 of them were re-examined. The licensed staff includes 20 persons for WWER-440 type reactors and 18 persons for WWER-1000. These are as follows: Plant shift supervisors - 2; Unit shift supervisors - 7; Reactor operators - 17; Supervisor physicists - 2; Shift supervisors in reactor department - 3; Shift supervisor in department of reactor protection - 3; Shift Supervisor in department of I & C - 3; Shift Supervisor in department of Radiation Protection - 2.

In 1998 totally 19 meetings of the SQC were held and 59 persons were examined. Among them 46 have been licensed at the first attempt. The licensed staff includes 25 persons for WWER-440 type reactors and 21 persons for WWER-1000. These are as follows: Plant

shift supervisors - 3; Unit shift supervisors - 15; Reactor operators - 11; Supervisor physicists - 7; Shift supervisors in department of reactor protection - 2; Shift Supervisors in department of I & C - 3; Shift Supervisors in department of Radiation Protection - 5.

From the second half of 1999 the licensing process of the management staff of the NPP "Kozloduy" will start.

## **8.7. Y2K problem and safety of Nuclear Installations**

### **Measures taken by BNSA, regulatory requirements and documents.**

In the beginning of September 1998 BNSA sent a letter to the Kozloduy NPP explaining the situation with the Y2K problem, information available from other NPPs, with an official request to present a special Y2K investigation and remediation programme. The deadline for presenting that programme was 31 March 1999. In February 1999 BNSA recommended the IAEA "Guidance for the Assessment and Remediation of the Year 2000 Problem to Maintain the Safety of Nuclear Installations" as an official guidance document to be used by the licensee.

### **Programmes and results presented by Kozloduy NPP.**

In March 1999 the licensee's Y2K programme has been presented. That programme is based entirely on the IAEA Guidance and includes:

- Order issued by Site Manager, which established the Central Y2K Commission and Y2K commissions for units 1-4 and 5-6. Head of Central commission is Deputy Site Manager responsible for safety, heads of other commissions are Chief Engineers of units 1-4 and 5-6. 36 people from NPP are members of these commissions;
- Initial inventory of equipment. 86 systems have been identified;
- Programme for initial assessment;
- Programme for detailed assessment;
- Programme for developing remediation plans;

The milestones of Y2K programme are as follows:

- Detailed assessment and developing of remediation plan – 30 April 1999;
- Remediation activities - 1 May – 31 August 1999;
- Beginning of contingency plan developing – 31 May 1999;
- End of contingency plan developing – 30 September;
- Emergency exercises – October and November 1999;

In the end of April 1999 NPP sent to BNSA the last official report, which includes the results from initial and detailed assessment programmes. Main results are as follows:

- Detailed assessment completed with some exceptions, main causes are delayed answers from some equipment vendors;
- 171 equipment units passed initial assessment;
- 112 units have been selected for detailed assessment;
- 77 units have been identified as "Year 2000 Ready"
- 31 units have been identified as "Year 2000 Not Ready" and remediation activities started;

Main units which are classified as “safety systems”, “systems important for safety” or “normal operation systems” and identified as “Year 2000 Not Ready” or “Not Answer From Vendor” are as follows:

- Main steam isolation valves (not answer from Edwards Valves, USA);
- Safety Parameter Display System (to be modified);
- Nitrogen-16 (not answer from SILENA, Italy);
- Fire Alarm System CZ16 (not answer from CERBERUS, Switzerland);
- Computer System for Operator Support (to be modified);
- System for registration of emergency transients INDACTIC 650 (not answer from ABB Industrie AG, Switzerland);
- System for earthquake protection (not answer from vendor);
- TITAN-2 software (to be modified)
- High pressure compressor 4V2 for Diesel Generator startup (to be assessed during annual outage, not answer from Siemens, Germany);
- CPU100 Simatic95-1000 for high pressure compressor 4V2 (to be assessed during annual outage, not answer from Siemens, Germany);

#### **Y2K related electric grid instability. Measures taken by BNSA.**

The major specific grid interface concern is that the Y2K problem causes a significant increase in the probability of the trip of nuclear units or the loss of off site power. In recent years, NRC probabilistic risk assessments have made it clear that a ‘Station Blackout’ at a nuclear power station is a major contributor to core damage frequency.

CUAEP sent an official letter to the National Electric Company with a requirement to present Y2K grid stability investigation programme and available results.

Bulgaria organized a council of experts and initiated actions to respond to the Y2K problem in accordance with the President of the Committee of Energy’s Order Number 317/01.09.98. Actions required by this order include an inventory of the information and management systems of all elements. As of December 7, 1998 seventy-two of these organizations (from a total of 74 companies and 30 branches) have completed estimates of the problems and funds required.

The considerations involved in planning and implementing activities for coping with the Y2K problem included examination of internal and external interfaces, clarification of supplier related issues, preparing scenarios for critical systems, and for new orders requiring supplier warranties related to Y2K compliance.

The systems analysis task performed included:

- 1 identification of critical time periods;
- 2 analyses of software upgrades to be made based on by software suppliers information;
- 3 fixing probable disturbance sources in systems software;
- 4 preparation of needed corrections;
- 5 evaluation of test configurations to simulate possible operational schemes;
- 6 implementation and testing of necessary modifications;
- 7 system upgrades with Y2K compatible versions;
- 8 fixing necessary hardware upgrades using new versions.

The control systems in the power plants are also being evaluated. In the Bulgarian Power System there are 2,820 MW of thermal and 1590 MW hydroelectric power on 14 thermal and 26 hydroelectric units that could be involved in Load Frequency Control from National Dispatching Center. The units control systems had different suppliers ABB, Siemens, Toshiba and control system produced in Bulgaria MICROSYST.

The installation of a new a SCADA/EMS (supervisory control and data acquisition) system at the Bulgarian National Control Center is in process, with the new SCADA system scheduled to be in regular operation by April 1999. The hardware, the UNIX 4.0 D operating system, and the application software are Y2K ready.

Telecom equipment (type Telegyr 065, 709, 709s, 803, 809), installed in power plants, substations and control centers is Y2K ready. The systems at the Regional Dispatching Centers and at control center of the city of Sofia, a distribution control center, are also being upgraded. Y2K is also a reason for the hardware upgrades. These upgrades will be completed by September 1999.

Following analyses, tests were run. These tests of the Bulgarian Power System were completed on October 8, 1998. All systems operated normally, except for problems with archive searches for the time period 1999 and 2000. Additional activities are planned. Action is in progress on telecommunications. The general conclusion is that the problem is under control.

Testing showed no problem with Automatic Generator Control or real time power application programs.

Work to evaluate interfaces with neighbors systems, telecommunications, etc. is reasonably established and is in progress.

The conclusion, presented by Bulgaria, based on these tests, was that everybody should perform such tests of systems and document these tests. The procedure used by Bulgaria of analyzing the situation (initial assessment), contacting suppliers (vendor evaluation), and proceeding on this basis provides a few simple initial steps. Power plants, regional control centers, and then national centers should be checked. An assessment could then be made of these systems. Then, after completion of the preliminary steps, investigative tests could be done by changing dates.

Also CUAEPP recommended to NPP to run additional re-training sessions of control room operators especially for full blackout incidents.

### **International co-operation.**

Experts from BNSA and NPP Kozloduy participated in IAEA Y2K workshop in January 1999. The summary of Bulgarian Y2K activities has been submitted to the IAEA Y2K WEB page.

A special Y2K project financed by EU PHARE programme has been established. Main contractor is AVN – Belgium. The purpose of the project is to compare Belgian and Bulgarian regulatory practices in addressing the Y2K problem. Based on this comparison improvements in regulatory approach will be identified.

### **Participation in Government Y2K programme.**

At a meeting on February 10, 1999, the Bulgarian “Program Council for Development and Management of a long-term Program to Implement Efficient Information and Managerial Technologies” decided to establish a “Y2K Problem Executive Council”.

Members of this Council are representatives of Government, Committee of Energy, Post and Telecommunications Committee, Ministry of Defense, Ministry of the Interior. In connection with the financial aid granted by the World Bank's Information Development Department (infoDev) the Program Council established a National Y2K Programme. In the frame of that Programme several seminars and conferences have been organised.

BNSA expert participated in Regional Y2K Conference for the European and Central Asian Countries, 29-31 March '99, Borovets, Bulgaria. Information about conference can be found on <http://www.govrn.bg/y2k/conf/rcy2ke.htm>. The presentation of BNSA expert can be found on [http://www.govrn.bg/y2k/conf/Ivan\\_Gorinov.ppt](http://www.govrn.bg/y2k/conf/Ivan_Gorinov.ppt).

## **9. Overview of the international assistance to the CUAEPP**

### **9.1. Scientific and Technical Co-operation of the CUAEPP**

After 1992, with the assistance of the EC, the CUAEPP was assisted by the Consortium of Western Regulators, which included AEA-Technology (United Kingdom), \_VN (Belgium), GRS (Germany) and IPSN (France). Assistance is received also by the operating organisation from WANO. In the process of development and licensing of the Programme for safety and operational reliability improvement of WWER-440 (V-230) units of the Kozloduy NPP, the so called "2+2" schedule was created in the documentation assessment process related to issuing of licenses for implementation of the modifications. Co-operation with the Consortium of Western Regulators is foreseen also during the licensing of the measures of the Complex Programme for Safety Reconstruction of the Kozloduy NPP units 1-4 and the Programme for Modernisation of the Kozloduy NPP units 5-6.

On a number of nuclear safety issues, the CUAEPP receives technical support from Bulgarian engineering organisations and institutes, such as: Institute "Energoproject", EQE – Bulgaria, Risk engineering, Enpro consult company, Institutes of Bulgarian Academy of sciences - Institute of nuclear research and nuclear power, Institute of metal science, Institutes of the Earth, etc.

The CUAEPP receives technical support from the IAEA, EC, United States and Japan for getting acquainted with the methodologies and existing practices of the developed countries in the areas of control, licensing and inspection practices.

The CUAEPP works in co-operation with:

- the Co-operation Forum of WWER Regulators;
- the Working Group of Nuclear Regulators to the EC;
- the Working and Consultative Groups of the IAEA;
- the United States Nuclear Regulatory Commission (US NRC), the Regulatory Body of the Russian Federation, Ukraine and Slovak Republic.

### **9.2. PHARE Programme - RAMG Assistance**

The EC Programme BG/RA/01 "Transfer of Western European Regulatory Methodology and Practices to the Nuclear Safety Authority of Bulgaria" has been implemented. The BG/RA/02 project was prolongation of the first year of work (contract 94-0066) and was successfully completed in July 1997. The general pattern for the second year programme

was that BNSA should produce policy, a procedure or technical documents based on the information gained during the first year of the programme.

The programme for the second year consisted of 9 tasks.

The completed regulatory assistance projects reached their objectives, i.e.:

- acquaintance of the ISUAE with the Western European methodology and practices, especially in the areas of regulatory regime, licensing practices, inspection and enforcement;

- improvement of the ISUAE regulatory practice, consolidation of this practice through establishment of internal procedures and start up of establishment of a comprehensive internal QA programme;

The third year of regulatory assistance (BG/RA/03) started in March 1998.

### 9.3. PHARE Programme - TSO Assistance

The TSO assistance was very successful. It started from the beginning of the short-term safety measures for units 1-2 in Kozloduy. The CUAEPP profited extensively from the joint assessments made through the application of the 2+2 approach.

#### *List of the Completed PHARE Contracts*

##### **Completed contracts 1991-1998:**

	BG/RA	Transfer of Western European Regulatory methodology and practice to the Nuclear Safety Authority of Bulgaria
1-A	BG/TS/0 1	Reinforcement of the Nuclear Safety Authority of Bulgaria: Phase 1
1-B	BG/TS/0 2	Reinforcement of the Nuclear Safety Authority of Bulgaria: Phase 2
1-C	BG/TS/0	Assistance to BNSA for the outage programme and inspection programme at Kozloduy unit 2
1-D	BG/TS/0	Assistance to BNSA for the outage programme and inspection programme at Kozloduy unit 1
1-E	BG/TS/0	Assistance to BNSA in the continuation of the licensing programme for Kozloduy unit 2
8	BG/TS/0	Support to CUAEPP in establishment of requirements for WWER-440/230 backfiring, evaluation of basic design and licensing of upgrading measures

### **Contracts in force:**

- |     |         |  |
|-----|---------|--|
| 1-F | BG/TS/0 | Licensing related assessments for design and operation safety of Kozloduy safety improvement programme and on-site programme for individual plant - Units 3&4, also RPV inspection of unit 1 |
| 2   | BG/TS/0 | Assistance to the Bulgarian Academy of Sciences in performing rod thermal mechanical simulation and calculations for improvement of the Kozloduy NPP safety and reliability (Feronia)        |
| 3   | BG/TS/0 | Assistance to BNSA for Safety Assessment of Kozloduy Units 5&6 and licensing of the related utility improvement programme including review of PSA  |
| 4   | BG/TS/0 | Assistance to BNSA in the development of requirements and procedures for decommissioning of Kozloduy 1&2   |
| 5   | BG/TS/0 | Assistance for the independent review and assessment of the Safety Assessment Report of Kozloduy 3&4   |
| 7   | BG/TS/0 | Nuclear Safety Expert - modernisation project Kozloduy 5&6   |

### **9.4. Technical Co-operation**

In addition to the assistance programmes CUAEPP has been participating in different forms of international co-operation. They provide up-to-date information and practices, develop personal contacts between the leading specialists from both sides.

#### **Technical Co-operation with Japan**

The bilateral co-operation between CUAEPP and Japan exists since 1992 in the framework of the International Invitation Programme of the Japanese Government for Safety Management at NPP. Till the end of 1998 totally 71 Bulgarian specialists participated in the following courses and seminars: Seminar on Nuclear Safety; Seminar on Radioactive Waste and Spent Fuel; General Administrator Course; Manager and Supervisor Course; Maintenance Personnel and Inspector Course on NPP Electric Systems; Maintenance Personnel and Inspector Course on NPP Automation and Control Systems; Antiseismic Design Course.

## Technical Co-operation with IAEA

During 1998 IAEA financed six Bulgarian projects for technical support to the total amount of 769 690 USD. Most important of them are, as follows;

- Strengthening the capabilities of the CUAPEP;
- Safety improvement of the Novi Han repository for Radwaste;
- Human resource training in the field of nuclear energy
- Energy and nuclear power planning study.

### 1998 IAEA Support

Forms of training	Area of Support	Nuclear Safety and Radiation Protection	Nuclear Energy and Fuel Cycle	Nuclear Medicine	Nuclear Methods in other fields	Total
<b>Fellowships</b>		6	4	7	2	<b>19</b>
<b>Scientific visits</b>		3	1	-	1	<b>5</b>
<b>Interregional training courses</b>		9	3	-	1	<b>13</b>
<b>Regional training courses and seminars</b>		34	41	6	6	<b>87</b>
<b>Total:</b>		<b>52</b>	<b>49</b>	<b>13</b>	<b>10</b>	<b>124</b>

More than 120 Bulgarian scientists were given the opportunity to further improve their knowledge and capabilities, and to exchange experience through scientific visits, fellowships and participation in training courses.

Significant support for identification and solving the nuclear safety issues was obtained through the IAEA expert missions IRRT, ASSET, OSART, IPERS.

### Co-operation G-24 and EC

Within the framework of different projects under the **PHARE** programme a large number of technical and organisational measures (including deliveries of equipment and instrumentation) were implemented.

## **9.5. PRIORITIES AND NEEDED ASSISTANCE**

### **Future CUAEPP Challenges**

In the longer term, Bulgaria considers all forms of international co-operation as an essential part of its future nuclear safety enhancement. It would be highly appreciated if the developed countries could contribute to this process by means of international assistance projects. The present economic situation in Bulgaria does not allow very precise forecast of the future developments regarding the nuclear power plant, the research reactor, the waste management and the electric energy production policy. The possible scenarios in Bulgaria are the operation of the older NPP units up to the end of their life time and the construction and commissioning of the next nuclear unit.

During 1999-2001 the CUAEPP will have to face several issues:

#### **Related to the Kozloduy NPP:**

- 1 assessment and licensing of the seismic upgrading of the wet spent fuel storage;
- 2 assessment and licensing of an interim dry spent fuel storage facility;
- 3 licensing activities related to the implementation of the safety improvement programme of units 5-6
- 4 licensing activities related to the implementation of the safety improvement programme of units 1-2 and 3-4 assessment of the SSR for units 1-2 and 3-4; licensing of units after implementation of the improvement programmes;
- 5 assessment and licensing of the constructed on-site waste treatment facility;
- 6 development of regulations on the NPP decommissioning;

#### **Related to other safety concerns:**

- 1 consequences of the future governmental decision of the either decommissioning or reconstruction and start-up of the research reactor, assessment and licensing of the possible actions related to the existing spent fuel and liquid radioactive waste;
- 2 developments in the area of the national waste management (upgrading the Novi Han repository, a new national waste repository).

CUAEPP will continue with improvement actions related to its own organisation, such as:

1. improvement of the quality assurance programme
2. development of regulatory requirements and licensing procedures
3. strengthening of the on-site inspection
4. proposing updating of legislation
5. improvement of the inspectors' training.