SURVEY OF THE ROMANIAN NUCLEAR INDUSTRY CAPABILITY.
CERNAVODA NPP UNITS 3 AND 4 PROJECT

Survey by the "Romanian Atomic Forum" Association - ROMATOM

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ROMATOM
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Chapter 1

EXECUTIVE SUMMARY

Making an analysis of the international evolution, we cannot oversee the fact that mankind is at a cross road, dominated by a fast growth of the worldwide population and by a series of challenges, among which we note the necessary energy supply, the need to dramatically decrease pollution and especially carbon emissions and to increase of the economic process efficiency.

The demographic growth resulting in the increase of the energy demand in the developing states, combined with a limitation of conventional resources and with the increase of the fuel price, have led to a worldwide increased interest for nuclear energy, considering the examples of the nuclear programs in China, Republic of Korea, India and United Arab Emirates or the latest nuclear power projects initiated in the United States.

At European level, as a result of the accident occurred to the nuclear plant in Fukushima, Japan in March 2011, 13 Member States operating 135 nuclear power units, covering approximately 27% of the nuclear power demand of the European Union maintained the nuclear option, some of them building or envisaging the construction of new units. Poland, which has no nuclear power plants, maintained its option for a new operational nuclear power plant up to 2020. Within the European Union, Germany, Belgium and Switzerland are the only ones that have decided to exploit the existent fleet of nuclear plants up to the end of the service life, without building new capacities.

Romania is part of this European nuclear concert with the two operational units from the Cernavodă nuclear plant (CNE), owned by S.N. NUCLEARELECTRICA S.A., endowed with CANDU 6 nuclear reactors, providing approximately 20% of the country power demand.

The reinstatement of the works and completion of the Cernavodă NPP Units 3 and 4 Project, as part of the Romanian National Strategy for Energy will generate additional power, with impact on the power supply security, reduction of carbon emission and efficiency increase, both at national level and at the consolidated European Union level.

The most important stages, already covered, of the work reinstatement process of the Cernavoda NPP Units 3 and 4 Project site are:

- the Project has been presented to the European Commission under the Article 41 of the Euroatom Treaty and after an extensive review the Government of Romania received a positive opinion for the implementation. This opinion recognizes that the Project has adopted risk-informed safety goals associated with “New Build” projects;
- successfully completing the Stress Tests demanded by the European Commission and voluntarily implemented by the European nuclear industry, including the Romanian industry; The project also addresses key lessons learned from the events at the Fukushima Dai-chi nuclear power plant in March 2011;
- the Licensing Basis Documents for the two units have already been approved by CNCAN - the Romanian Regulatory body. These documents define the regulator's

technical licensing requirements. Together with the Letter of Comfort, which contains a positive pre-project licensability statement issued by CNCAN in May 2012, this indicates confidence that the design of the units is licensable;

- entering into the final stage of the contract negotiations for the procurement, engineering and construction with the consortium including SNC LAVALIN, ANSALDO NUCLEARE, ELCOMEX IEA and the assigned subcontractor CANDU ENERGY;
- updating the Project Feasibility Study
- the Environment Permitt was released by the Romanian Government in September 2013, based on European regulations evaluation performed by the Romanian Ministry of Environment and Sustainable Development.

It is still necessary to settle the partnership at subcontracting level and the overall supply chain for the execution of this special and very complex project as well as the fundraising issue.

In this context, the nuclear industry in Romania considers that a correlation of the European Union Member States efforts which involve nuclear power development programs, for the purpose of identifying the best solutions and financial instruments to support the funding of technologies with no carbon emissions, including of new nuclear plants and the agreement thereof with the European Institutions, is the only way to proceed, inviting the policy-makers to actively engage in these actions.

Once these issues are clarified, there will most certainly be investors and funding sources ready to complete the Cernavodă NPP Units 3 and 4 Project.

Considering the current status, upon the initiative of the Romanian Atomic Forum Association - ROMATOM members, in the very long expected perspective of reinstating the works for the Cernavodă NPP Units 3 and 4 Project, a dedicated Task Force was created within ROMATOM, with the purpose of assessing the capacity of the nuclear industry in our country, both in the private sector, as well as in the public sector, to participate to this investment.

Based on ROMATOM information, taking into account the list with the association members, the list of companies authorized by the National Commission for Nuclear Activities Control - CNCAN and the suppliers authorized by Nuclearelectrica, as well as based on the information from the Romanian industry, the Task Force members identified and contacted a number of 71 companies, members or non-members of the association, sending them a questionnaire with the request to fill it in.

From the 71 contacted companies, 47 companies responded and they are classified as follows:

a) 20 companies specialized in manufacturing of components, equipment and other activities
b) 14 companies specialized in constructions-erection and /or other services
c) 13 companies specialized in engineering, design, research and consultancy services

and in the cases which required the clarification of some issues contained in the answers, the experts of the ROMATOM Task Force visited some of these potential suppliers of goods and services.

The interest of the national industry for this project is obvious, since an important part of it is included in providing operational and maintenance services to the existing Units 1 and 2 at Cernavoda NPP. There are also companies which did not deliver goods and services for these

projects, but which are able and qualified to do so, some of them being already suppliers for the international nuclear market.

The responding companies possess the necessary licenses, CNCAN authorizations or international certification or they can obtain them with no effort considering their experience and they possess the skilled personnel corresponding to the magnitude and challenges of a nuclear project.

ROMATOM assessments indicate that currently there are 8,300 skilled workers dedicated to the support activities in the nuclear power sector, and in case of a new nuclear project, more than 7,800 jobs would be necessary, thus there would be at least 16,000 jobs in the national industry for the completion of Units 3 and 4. This minimum estimate does not include the Romanian personnel involved in the owner's activities, including commissioning and operation of the two new units.

All companies which responded to the ROMATOM questionnaire and are willing to be involved in the project for Units 3 and 4, have a total turnover of approximately lei 2.4 billion (approx. Eur 550 million), covering the three aforementioned categories, the weight being, obviously, in the equipment and component manufacturing field.

As a conclusion of the assessment made by ROMATOM, the Romanian economy has an important capacity and it is opened to participating to the completion of Cernavodă NPP Units 3 and 4, covering the commissioning, operation, maintenance services and the provision of heavy water and nuclear fuel, the execution of the construction-erection works, the delivery of mechanical and electric equipment, as well as the design, consultancy and research support services.

ROMATOM estimates that the potential participation of the Romanian nuclear industry to the completion of the Cernavoda NPP Units 3 and 4 with the goods and services identified within this report can be assessed at approximately 40-45% of the total project value, which represents an important contribution, with a special impact on the national economy.

Considering the strategic reasons as well as the three pilars of the European nuclear strategy related to the security of the energy supply, sustainable development and competitiveness, it is obvious that the completion of Cernavoda NPP Units 3 and 4 is a priority project to ensure the provision of Romania's energy security, with direct benefits related to the fulfilment of the objectives of the national power strategy and maintenance of the ability of the final consumer to support the power price.

In conclusion, considering the interest for the optimal development and best use of the existing capacities of the Romanian nuclear industry, we make the following recommendations to the decision-makers, in compliance with the European conduct regulations on the free competitive market and being fully aware of the fact that the participation of the Romanian industry to the completion of Cernavoda NPP Units 3 and 4, cannot be subject to a simple administrative measure from the Romanian public authorities:

- The completion of Cernavodă NPP Units 3 and 4 is a process which must provide trust to all participant categories (investors, technology, goods and services suppliers, etc.), and this trust can only be provided by the Romanian Government by continuing to support and assist the Romanian nuclear power program.

- ROMATOM considers that the main issue of completion of the Cernavodă NPP Units 3 and 4, as well as of other large energy projects in Europe and worldwide, is represented by ensuring the necessary funding, in the form of equity and borrowed loans (debt). In this context, it is necessary for the Romanian Government to identify the specific patterns and mechanisms necessary to solve this issue, including granting sovereign guarantees for external loans**, to be borrowed for Cernavodă NPP Units 3 and 4 Project completion**.
- An intelligent lobby at European and international level is recommended by finding new mechanisms able to facilitate the fundraising, including within the energy market and which would allow the implementation of large investment projects in the nuclear and classic energy field.
- ROMATOM considers that Romania has a direct interest in promoting the involvement of the local industry in this project, aiming for the important investment funds attracted for the project execution to be used to the largest extent possible in the national economy, with a direct contribution to economic growth and employment and additional income to the state budget.
- The Romanian authorities will have to identify the measures for promoting the Romanian industry involvement in this project, which are probably similar to the ones practiced in other countries, even in the conditions imposed by the market economy. ROMATOM is convinced that these measures will be identified together with the project beneficiary S.C. EnergoNuclear S.A.
- **The investors, as well as the participants to the project implementation should be oriented towards the internal market by measures meant to stimulate the use of local opportunities, by official applications to research and capitalize on the technical and productive potential of the local market, as recognition of the efforts made by Romania to complete this project.**
- ROMATOM considers that, applying a firm national investment policy related to the energy infrastructure, **Romania has the opportunity to become a regional energy pole for South-Eastern Europe**.

Chapter 2

NUCLEAR POWER AT INTERNATIONAL LEVEL AND IN ROMANIA[1]

2.1. A Changing World

We find ourselves at a cross-road in the mankind evolution, dominated by a rapid growth of the worldwide population, as well as by a series of challenges, among which we note the security of the energy supply, the need to dramatically limit pollution and especially carbon emissions, the increase of the economic process efficiency.

The planet population which already counts 7 billion inhabitants, of which only 6-7% are found in the 27 member states of the current European Union, and approximately 36% in China and India is estimated to reach approximately 9 billion in the year 2050.

A major change is expected related to the the Gross Domestic Product (GDP) distribution between the 'developed' countries, part of the Seven Group 'G7', as considered today, including USA, Japan, Germany, Great Britain, France, Italy and Canada and the developing or „emerging" countries, the so-called 'E7', including China, India, Brazil, Russia, Indonesia, Mexico and Turkey. If for the year 2010, the energy quota used by E7 represented 20% from the one consumed by G7, in 2050 this ratio is estimated to reach 175%, given that the GDP of the emerging states will raise spectacularly, mostly in China and India.

When using a 1 to 100 scale to compare the current GDP with the one estimated for 2050, the results would be as follows:

- 2010: USA (100), China (39), Japan (37), Germany (23), Brazil (14), India (10);
- 2050: USA (100), China (98), India (58), Brazil (20), Germany (15).

In this context, the International Energy Association estimates an increase of the global energy demand of 47% up to 2035, of which 90% in the non-OECD countries and the coverage of this demand would mean a financial effort estimated at US$ 38,000 billion.

Considering a series of aspects, among which:

- currently, 20% of the planet population has no access to electricity;
- the dominant use of oil in the developing countries for transportation;
- the extensive use of fossil resources to generate electricity, the significant climate changes, with a potential rise of the average global temperature by approx. 3.5-6.0 °C with dramatic consequences on the water supply and global population stability, with potential massive migration possibilities;

[1] Sections 2.1 and 2.2 of this chapter are based on Jean-Pol Poncelet, Director General of FORATOM presentation done in front of the FORATOM Executive Board members on May 3rd, 2011

- in spite of a brilliant future of renewable resources and natural gas, the elimination of the nuclear power from the global energy mix would have significant consequences on the increase of fossil fuel demand, with serious effects on the aforementioned aspects.

In a context in which the climate issues represent the determining factor of the switch from low carbon technologies to carbon neutral ones, it is widely acknowledged that among the technologies able to contribute to this cross over, namely renewable energy, carbon capture and storage (CCS) and nuclear power, the latter is the most mature one. The demographic growth determining the increase of the energy demand in the developing states, combined with a limitation of conventional resources and increase of the fuel price, led to a worldwide increased interest for nuclear energy, considering the examples of the nuclear programs in China, Republic of Korea, India and United Arab Emirates or the latest nuclear power projects initiated in the United States.

At last, we note that worldwide, at the end of 2011, there were 45 nuclear power plants operating in 30 states, covering approximately 19% of the electricity demand of mankind by generating more than 2,500 GWh each year. Also, on June 30th, 2012, 62 nuclear power units with an installed power of 52.9 GW(e) were under construction.

2.2. Europe, a Paradox!

The launch of the Energy Roadmap in 2011 by the European Commission opened the door to European debates on the methods to handle the energy and climate challenges, considering the fact that all decarbonization methods involve major changes of the fossil fuels, distribution technologies and transportation networks, with major impact on (1) the cost of energy used for household purposes and (2) significant increases of the capital costs for the new projects. It is expected for the massive development of renewable energies to have as final effect the reduction of the associated costs and the cross over from the current „subsidized" technologies to future „competitive" technologies.

The nuclear power is recognized as a significant power source with a reduced carbon level, which still has to face the challenges determined by its acceptance by the population concerned with nuclear security issues, radioactive waste and their proliferation. In a „regulated - deregulated" debate, mainly starting from the argument of an impossibility to accumulate the funds required to develop major projects on a deregulated market, either nuclear or conventional, the discussion related to the energy market structure is more and more vivid.

The resolution of the Energy Roadmap 2050 drafted by the European Commission and voted on March 14th, 2013 defines the priorities of the future power and climate policies of the Union and the targeted 80-95% reduction of the European carbon emissions up to 2050. The resolution recognizes the role of the 'no regret' option, offering chances to all low carbon power generation forms, including the „development of renewable energies, power efficiency and energy infrastructure, including intelligent networks [...], in particular when guided by the market". The European Parliament also endorsed the opened approach of Mrs. Tzavela, rapporteur and member of the European Parliament, related to the possibility of capitalizing the entire power production with low carbon emissions, including the carbon (CSC) capture and storage, and nuclear technology together with the aforementioned technologies.

From the nuclear point of view, Europe is a "living paradox"! It is a worldwide leader regarding the installed capacity in the nuclear plants and the large number of companies exploiting them,

the equipment production and nuclear fuel cycle, facing an increasing competition with the nuclear industries from the United States, Republic of South Korea, Russia, China, Japan, and also being confronted with the concerns of a large part of the Union's citizens related to nuclear power, and especially related to nuclear security, radioactive waste and proliferation.

The nuclear accident in Fukushima, Japan on March 11th, 2011 caused by an unexpected external event (earthquake followed by an enormous tsunami), correlated with an unacceptable design fault, had a wide media impact, through the social media and Internet, revealing the unprecedented consequences of a psychological trauma suffered by the population in Fukushima prefecture, in spite of the fact that there were no direct casualties and no significant effects upon the population physical health. The worldwide industry had to face the question related to how to handle the requirements to avoid any external contamination of the population, soil, air and water, in case of an accident.

In this context, the voluntary implication of the European Union Member States in the „Stress Tests" initiated by the European Union Council, immediately after the Fukushima accident, shows the determination of the involved parties (national regulatory bodies, owners and operators of nuclear power plants, engineering, design and research organizations, etc.) in reassessing the response of the existing nuclear power plants to external natural or man-induced events. The first round of this process, which is obviously not finished yet, is encouraging and the results are positive, but they are followed by the implementation of the identified measures and the more profound analysis and developments in line with the nuclear security consolidation.

Still, Europe remains divided to a large extent regarding the use of nuclear power, in the context of Germany accelerating the exit from the nuclear power area, with a significant additional price paid by the consumers and significant increases of carbon emissions, of Switzerland deciding to stop any initiative related to the construction of new nuclear power plants and of Italy deciding not to return to nuclear power. The 13 Member States operating nuclear plants are still remaining, with a total of 135 nuclear reactors, covering approximately 27% of the European Union's energy demand, avoiding emissions of more than 600 million tons of CO2 equivalent.

On continental level, 14 Member States of the European Union, the Russian Federation and Croatia (country in asscession process) maintained their nuclear option for a predictable time horizon. Among these, Finland, France, Slovakia and the Russian Federation have ongoing nuclear projects. Great Britain remains a promoter, but also an innovator in finding new instruments for supporting the financing of high power energy, non-carbon projects and Poland has high ambitions in the nuclear field development, motivated to a large extent by the need of reducing the dependency of the natural gas import, which is a general commandment of the Union's Member States.

During the nuclear power development process, both worldwide and at European level, in addition to the concerns caused by the consequences of the accident in Fukushima, the financial barriers affecting the high capacity energy projects, from which we quote the nuclear ones, accentuated by the worldwide financial crisis, can be noted among the major conditionalities.

Voices from the international banking[2] and financial consultancy[3] world share the industry concerns related to the sponsors' lack of amenity for large European projects (nuclear, hydro

[2] "Very Hostile Political Enviropnment", City Investment Research&Analysis, Sepember 13. 2011

[3] "Power Sector Development in Europe – Lender's Perspectives 2011", KPMG

related ones), urging for the implementation of a series of measures to reduce the funding risks, such as governmental support in the form of a sovereign security reducing the specific risks, the encouragement of long term power supply contracts, concluded in transparent conditions and with mutually beneficial terms and conditions, the balanced approach of the three pillars of the European strategy - the climate changes, the economic efficiency and the energy safety - the balanced approach of all forms of power generation which does not generate carbon emissions.

The role currently played by Great Britain in the development of new instruments for supporting the funding of large energy projects was mentioned above, including the state aid granted to the developers of such projects within a partnership beneficial for the parties, the increased role of the Export Credit Agencies in financing nuclear projects and granting state securities. At global level, the example set by the United States in supporting all non-carbon technologies, with no exception, both renewable and nuclear ones, in an effort to reduce emissions, but also to maintain the energy industry efficiency, must not be left out.

In this context, the nuclear industry in Romania considers that a correlation of the efforts of the European Union Member states in creating nuclear power development programs, to find the best solutions for supporting the funding of new nuclear plants and to agree upon these solutions with the European Institutions is the only approach possible, inviting the political decision-makers to actively get involved in this action.

2.3. "Nuclear Romania"

The CNE Cernavodă Units 1 and 2 CANDU 6 type, under commercial operation since December 1996 (Unit 1), respectively November 2007 (Unit 2), have an important and constant contribution to covering the power demand in Romania, operating at the basis of the load curve of the National Grid. The installed power of each nuclear power unit from CNE Cernavoda is 705 MWe. The main results obtained so far are:

- ranking amongst the most efficient nuclear power plants in the world; at the end of year 2011, Unit 1 was placed on the 3rd worldwide position, respectively Unit 2 on the 40th position, for the period 2008-2011;
- the annual production of a nuclear power unit of CNE Cernavoda was between 4.90 TWh (in 2003, a very droughty year) and 6.15 TWh, the best performance being recorded in 2009, when Unit 1 generated 6.15 TWh, respectively Unit 2 - 6.08 TWh in 2012;
- with the two nuclear power units, CNE Cernavoda generated in 2012 approximately 20.2% of the total energy production in Romania;
- CNE Cernavoda also supplies the heating of Cernavoda town, delivering approximately 40,000 Gcal annually, at the lowest generation price in the country.

The achievement of the aforementioned performances takes place in the conditions of a reduced radiological impact on the population and environment, with an average of 0.57% for the last 15 years of the maximum limit value required by the national and international legislation. Also, special attention is granted to the operating personnel, the doses accumulated in the operation of the two units being significantly below the legal professional regulations and far below the worldwide average in nuclear plants of the same type (CANDU).

As a result of the accident occurred at the nuclear plant in Fukushima, Japan on March 11th, 2011, the National Commission for Nuclear Activities Control - CNCAN and the nuclear industry in Romania, have voluntarily aligned, in consonance with the other Member States, to the initiative of the European Union Council related to the „stress tests" performance, considering the assessment of the nuclear plants behaviour in extreme situations (earthquake or floods exceeding the designed bases, any other site specific extreme external conditions, the total loss of power supply from the alternative current sources, the loss of the final cooling source, the damage of the active reactor area and loss of cooling to the spent fuel storage installations).

The country report drafted by the Romanian specialists and CNCAN experts was also assessed by the experts of the European Commission in cooperation with representatives of the regulation authorities from other EU Member States, being subject to a peer-review mission organized by the European Commission for the purpose of verifying the measures implemented after the accident at Fukushima, as well as clarifying, by consulting the documentation and discussions with CNCAN representatives and other invited Romanian specialists, issues presented in the national report related to the stress tests. The report of the assessment mission revealed the need to implement actions (project changes or improvements of operational procedures), almost all of them alreay implemented at CNE Cernavoda Units 1 and 2, in accordance with the schedule agreed upon by CNCAN and included in the national report related to stress tests.

In 2007, after the approval of Romania's power strategy for 2007-2020, the Romanian Government initiated the completion of Cernavoda NPP Units 3 and 4, by issuing a Government Decision for the incorporation of a "joint venture" project company, attracting capital through the involvement of foreign investors, interested in funding the project completion and taking over power for their own purposes or for sale on the energy market in Romania. The fact, that at that time, the project for the Cernavoda NPP Units 3 and 4 was considered as the most attractive nuclear project in Europe is notable, the result being the attraction of six investors with a powerful financial force: ARCELORMITTAL, CEZ POWER, GAS DE FRANCE – SUEZ, ENEL, IBERDROLA and RWE POWER.

Thus, in March 2009, the company S.C. ENERGONUCLEAR S.A was established and registered in Romania, whose mission is to develop the completion project of Cernavoda NPP Units 3 and 4. In the context of the economic crisis, but also of uninspired political decisions and lack of decision during the period 2008-2011, four well-known partners (CEZ, GDF SUEZ, IBERDROLA and RWE) withdrew from the project during 2010-2011 and thus, beginning with February 28th, the shareholder structure included only SN NUCLEARELECTRICA (with 84.65% of the total number of shares), ARCELORMITTAL (holding 6.2% of the total number of shares) and ENEL (holding 9.15% of the total number of shares). **The major issue that this project is facing today is the difficulty to identify the necessary funding mechanisms and sources.**

Considering the important role of the two nuclear units from the Cernavoda site, in the context of the insurance commandments in the 2020 perspective of security of energy supply, limitation of greenhouse emissions and increase of the economic efficiency of the power generation, in November 2012, the Romanian Government analyzed and

decided upon a series of immediate measures related to this project completion. Among these, the decrease of the Romanian party participation up to approximately 40% and the offer of the option to the remaining investors (ARCELORMITTAL and ENEL) to increase their participation are the options considered together with the expansion of the future investors' profile. For this process to be successful, there are a series of aspects to be considered, such as the redefinition of the „business" pattern and the project funding structure, the attraction of the Credit Export Agencies to finance the investment, the redefinition of the state role in achieving large energy projects and the implementation of new market mechanisms supporting all „non-carbon" technologies, a reform of the energy market being required in this respect. The international economic-financial context is not a favourable one, and a substantial delay in making a decision endangers the completion of the Cernavoda 3 and 4 project, in case most of the production units of the Romanian energy system are already obsolete, pollutant and non-economic. **Giving up on this project will significantly affect the efficiency and security of the power system, will demobilize up to extinction the Romanian horizontal nuclear industry and a series of already performed expenditures (existing structures, heavy water, consultancy during 2009-2012, etc.), representing approximately a billion Euro, will no longer be capitalized.**

The fact that the project has significantly evolved in other directions must not be neglected, noting the favourable opinion of the European Commission issued on November 11, 2010 (as per the Article 41 of the EURATOM Treaty), finalizing the authorization requirements, obtaining a „comfort letter" from CNCAN certifying the „possibility to licence "Units 3 and 4, considering the proposed project amendments, the resulted nuclear safety improvements and the updating of the seismic hazard study. All these activities mainly developed in cooperation with ATOMIC ENERGY of CANADA Ltd., owner of the CANDU technology license (currently CANDU ENERGY Inc. Canada), with the support of an international, independent, „Owner Engineer" consultancy grouped during the period 2009-2010 within the consortium including AMEC, IBERDROLA Engineering and TRACTEBEL, which added a substantial credibility value to all these actions.

Important progress occurred during 2011-2012 in the negotiation of the engineering, procurement and construction (EPC) contract with the consortium including SNC LAVALIN, ANSALDO NUCLEARE, ELCOMEX IEA and the subcontractor CANDU ENERGY Inc. During the same period, the Project Feasibility Study was updated and completed in 2012 by ERNST & YOUNG, proving the long term feasibility of this project.

Right from the beginning of the national nuclear program, in the early 80', Romania developed a strong industrial infrastructure dedicated to the construction, operation and maintenance of CANDU nuclear power plants, including the manufacture of nuclear and conventional equipment and components, construction-erection, commissioning, design and engineering activities, as well as a research and development infrastructure to support the national nuclear program. To a large extent, this infrastructure currently belongs now to the private sector, developed after 1990, and had a significant role in completing and providing the support for the operational CNE Cernavoda Units 1 and 2. Also, a series of new companies were created, with private, Romanian or foreign capital, which develop industrial and engineering activities in our country, both for the national and international nuclear power industry.

The role of this report executed by the ROMANIAN ATOMIC FORUM Association is to update the inventory of this potential and to provoque the appetite of potential participants to get involved in this new major challenge to complete Units 3 and 4 in Cernavoda.

Chapter 3

POTENTIAL OF THE HORIZONTAL ROMANIAN ECONOMY WITHIN THE NUCLEAR PROGRAM

3.1 Assessment Methodology

The assessment of the horizontal Romanian industry potential to carry on the nuclear program represents an update of the similar assessments performed in 2003-2004 within the Task Force for the National Nuclear Program (GL PNN). The patterns and the steps taken to achieve this update of the Romanian nuclear industry capability were analyzed and finalized within the recent ROMATOM Task Force, using a methodology similar to the previous assessment from 2003-2004.

The objective of this assessment was not directed towards the steel and other raw material producers, considering that both the equipment manufacturers and the assembly-construction companies currently practice the material insurance system management, including the procurement and manufacture of all necessary components for the supplied products/services.

Thus, the following steps were identified for this assessment methodology:

I. The identification of 71 companies to potentially participate in the project completion for Cernavoda NPP Units 3 and 4, based on the following information sources:

a) List of companies with CNCAN authorization, valid for works/services in the nuclear field;
b) List of ROMATOM members;
c) List of the authorized suppliers of S.N. NUCLEARELECTRICA/CNE Cernavodă;
d) Information available to the Task Force members

The fact that companies, both members and non-members of ROMATOM, were contacted, it is worth mentioning, as the affiliation to ROMATOM is not an acceptance/elimination criterion within the analysis. The list of identified companies is presented in Annex 1.

II. Drafting a questionnaire (attached model - Annex 3) sent to the 71 companies identified as potential suppliers of equipment and services to participate in the completion of Cernavoda NPP Units 3 and 4. This questionnaire was sent as an annex to a letter of intent from ROMATOM, explaining the purpose of this action and requesting answers to the questionnaire, in a reasonable time frame for performing the answers analysis and interpretation.

III. The visits of some potential goods and services suppliers in Romania by a team of specialists of the ROMATOM Task Force, to clarify some issues related to the answers received to the questionnaires.

IV. The summary information and conclusions of this report are relying on the answers to the queestionnaires provided to the industry, together with the result of visit at sites, where necesary.

3.2 Findings during the assessment of the Romanian horizontal economy in the nuclear field.

After sending the questionnaire, 47 companies, representing approximately 65% of the total identified ones, answered the ROMATOM questionnaire. Their answer represented the basic structure for the assessment of the ROMATOM Task Force. In addition, some information received from Nuclearelectrica was used for the companies on the list of agreed suppliers, mainly involved in the operation and maintenance activities at CNE Cernavoda Units 1 and 2.

To organize the information, the respondents (Annex 2) were grouped into the following categories:

a) 20 companies specialized in the manufacturing of components, equipment and other activities;
b) 14 companies specialized in construction-erection and /or other services;
c) 13 companies specialized in engineering, design, research and consultancy services.

The following conclusions have been generated by the analysis of the questionnaire answers:

There is a definite interest of the companies which responded to offer equipment/materials/ services for Cernavoda NPP Project, according to their activity field. Annex no. 4 presents details related to the capabilities and qualifications of the companies which answered the ROMATOM questionnaire. The information specified in the table of Annex 4, includes the relevant activity field for the Cernavoda Unit 3 and 4 project, the recognition as Nuclearelectrica's suppliers, the scope of supply delivered for Units 1 and 2 or the possible recent participation to pre-project activities for Units 3 and 4, as well as the CNCAN license/licenses and the validity term thereof.

Due to confidentiality reasons, Annex 4 does not include elements such as turnovers, number of personnel, detailed activity fields/programs and /or the performance rate in the development of CNE Cernavoda contracts. However, the answers to the ROMATOM questionnaire were used for global assessments while drafting this document.

The Romanian horizontal industry, specialized in the manufacture of nuclear equipment and components, which might have a contribution to the construction of Cernavoda NPP Units 3 and 4, includes companies with sufficient experience (exceeding 5 years), in their activity field. More than 10% of them have the know-how or various manufacturing licences such as:

- Automatica has a Siemens license to manufacture multifunctional power panels;
- POPECI UTILAJ GREU has licences from Siemens and General Electric for turbine enclosures with medium, low and high pressure;
- ROSEAL has the know-how in the field of mechanical seals;
- TITAN ECHIPAMENTE NUCLEARE (TEN) has a technology transfer from General Electric for the heads of the loading-unloading machine;
- GENERAL TURBO can provide its own products based on the assimilated and subsequently developed licences;

- Nuclearelectrica/FCN Piteşti provides the manufacture of the nuclear fuel for the CNE Cernavoda Units 1 and 2, after the CANDU license;

Regarding the companies specialized in construction-erection activities, it can be confirmed that they are an almost permanent presence in the CNE Cernavoda activity, either through their participation to the completion project of Units 1 and 2 (ELCOMEX IEA, UNIFY, GENERAL CONCRETE, IMSAT, STIZO, NIMB, etc., or by the execution of the predictive and planned maintenance works (planned works) of these nuclear power units. The take over by these construction-erection companies of several activities outsourced by CNE Cernavoda (ELCOMEX IEA, UNIFY, GENERAL CONCRETE) must be noted. Starting 2007, for the performance of the maintenance activities to Cernavoda Units 1 and 2, the construction-erection companies from the CNE Cernavoda site set-up the NUCLEARSERV asssociation, with which the beneficiary SNN SA, concluded multi-annual maintenance contracts. For the purpose of preparing the contracting of the construction-erection activities for Cernavoda NPP Units 3 and 4 in 2008, the Association of Nuclear Construction-Erection (ACMN) was formed. The main purpose of ACMN Cernavoda is to prepare the contracting of the construction-erection execution and the procurement of the related materials for Cernavoda NPP Units 3 and 4. For the fulfillment of the aimed purpose, within ACMN Cernavoda, aside from the founding members represented by the construction-erection companies from the CNE Cernavoda platform, other Romanian construction-erection commercial companies will be co-opted, as associated members. In this manner, ACMN Cernavoda will provide the necessary capabilities to execute and guarantee construction-erection works in the nuclear power field, in compliance with the technical requirements and quality management specific requirements in this field. The creation of ACMM Cernavoda meets the demands of the Cernavoda NPP Units 3 and 4 beneficiaries, achieving an important step in providing execution services of the construction-erection works in a coordinated manner and according to the technical and quality requirements specific to nuclear energy.

Also, the companies specialized in engineering, design and consultancy can have an important weight in supporting the design-engineering activities related to the Units 3 and 4 project, considering their existing experience in completing Units 1 and 2, the support provided during their operation, as well as the involvement in other nuclear projects in the country or abroad.

- Among the companies providing design and consultancy services for the execution and commissioning of CNE Cernavoda Units 1 and 2, some of them also providing design services during their operation period, the following can be noted: RATEN/SITON, ISPE, SERTO, AMEC, ENERGOTECH, IPROCHIM;
- RATEN/SITON was the local subcontractor of AECL, and AMEC and TRACTEBEL, in consortium with IBERDROLA ENGINEERING, provided consultancy services in the pre-project stage of Cernavoda NPP Units 3 and 4.;
- Celin developed design activities as a subcontractor of ICSI Rm. Vâlcea (tritium removal project), and ISPE and GVC COMPLETE PROJECT which provided consultancy services to the NATIONAL URANIUM COMPANY in the mining field and uranium ore preparation.

In the research-nuclear development field in Romania, the existence of the necessary capability and experience was a determining factor, this field being able to make its contribution to the continuation of the nuclear program. RATEN/SCN provided component testing services, post-irradiation services and technical assistance for the CNE Cernavoda Units 1 and 2 and ICSI Rm. Vâlcea provided research, consultancy and design services for both the heavy water fabrication

and during the execution of CNE Cernavoda Units 1 and 2, being currently involved in the management of the execution and commissioning works of the tritium separation installation of Unit 1. IFIN-HH is involved as the owner and project manager for the Extralight Infrastructure Nuclear Physiscs (ELI-NP) Project, one of the most exciting European research initiatives under development in Romania, in parallel with other two complementray projects under implementation in Czech Republic and Hungary.

Most of the analyzed companies maintained their good practice of performing their activities in compliance with the requirements of the quality management system, which allowed them to develop specific activities for Cernavoda Units 1 and 2. Thus, more than 80% of the companies answering to the questionnaire (see Annex no. 4) maintained the CNCAN licenses for the quality management. Some of them, although they had no orders in the nuclear field, such as UZUC, FEPA, ELECTROPUTERE, etc., requested further licensing from CNCAN, having licences valid on the date of this assessment. Another group of companies, from which we mention VULCAN, GRIRO, DOOSAN-IMGB, WALTER-TOSTO-FECNE, POPECI UTILAJ GREU, declared in the questionnaire that they are willing to request the CNCAN licensing at any time, provided there are internal orders for the nuclear field. We note that these companies already have quality insurance systems certified by other certification bodies (ISO, ASME, LOYD, BUREAU VERITAS, etc.). In these circumstances, it is assumed that in case of issuing several orders, they would be able to satisfy them, both from the technical viewpoint and the nuclear quality requirements viewpoint.

The management system applied in all companies answering the questionnaire is an integrated one, including the simultaneous satisfaction of the quality, environment, health and security requirements. This issue is also important, knowing the specific manufacturing requirements of the nuclear objectives.

80% of the companies which answered the questionnaire were involved in nuclear projects. Some of them had an essential contribution to the construction of Cernavoda Unit 1 and 2, such as: AUTOMATICA, AVERSA, ENERGOMONTAJ, ELCOMEX IEA, ELECTROPUTERE, FEPA, ISPE, NIMB, TEN, RAAN/SITON, STIZO, PROMPT-UMT, UZUC, VULCAN, etc.

Although they have no orders from the nuclear industry in Romania, companies such as DOOSAN IMGB, WALTER TOSTO-FECNE, GRIRO, POPECI UTILAJ GREU have orders for the nuclear field from other countries, either in the production facilities in Romania or at the mother companies.

The training level of the personnel within 90% of the companies is very good, the staff being qualified or authorized for activities specific to those companies. For example GRIRO, WALTER TOSTO-FECNE and POPECI UTILAJ GREU have welding schools and/or personnel training centers for their own necessities.

The number of jobs in the horizontal nuclear industry in Romania is currently estimated to a number exceeding 8,300 persons, according to the data sent by the respondents. Regarding the possibility to create new jobs by accepting possible orders for Units 3 and 4, the answer of the companies providing these numbers indicated the fact that more than 7,800 jobs may be created, especially for the construction-erection activities. In conclusion, at least 16,000 jobs can be generated in the national industry for the completion of Units 3 and 4.

Regarding the potential of the identified companies, reflected in the turnover, according to the ROMATOM questionnaires, the situation is the following:

- The companies specialized in the manufacturing of components, equipment and other activities recorded a turnover of approximately lei 1.5 billion, in 2012.
- The companies specialized in construction-erection and/or other services recorded a total turnover of approximately lei 640 millions, in 2012.
- The companies specializing in engineering, research and consultancy recorded a total turnover of approximately lei 265 million in 2012.

All companies answering to the ROMATOM questionnaire and willing to participate in the project for Units 3 and 4, have a total turnover of approximately lei 2.4 billion, meaning approximately Eur 550 billion.

With all the difficulties of the current global economic-financial situation, most of the responding companies registered significant turnovers and even net profits. This was mostly possible through the production orientation towards export, in collaboration with worldwide renowned companies. Thus:

- POPECI UTILAJ GREU is an authorized supplier, among others, for: Siemens, General Electric, Skoda, ABB, AIRBUS, Caterpilar, etc.
- WALTER TOSTO-FECNE is an authorized supplier for: Exxon Mobil, Linde, Agip KCO, Petrobras, KNPC, Bechtel, etc.
- VULCAN has orders and exports in more than 47 countries worldwide;
- GRIRO is an authorized supplier for more than 45 renowned companies, such as: Alstom, Linde, Siemens, ABB, Mitubishi, Hitachi, etc.
- UZUC is an agreed supplier for: ABB, Du Pont, Sulzer, Bechtel, Hunday, Tractebel, Samsung, Zimmerman, etc.
- DOOSAN-IMGB Romania executes subsets for nuclear equipment (reactor vessel, steam generator, etc.) for the mother company in the Republic of Korea.

As a result of ROMATOM visits, it was determined that the manufacturing spaces were reduced to the necessary areas for the manufacturing ranges related to the existing orders. The re-technologization and modernization of the existing equipment represent a permanent concern of all targeted companies. The most interesting results in this field were obtained by: WALTER TOSTO-FECNE, POPECI UTILAJ GREU and AUTOMATICA.

3.3 The involvement potential of the horizontal Romanian economy in the nuclear field for the completion ofCernavoda NPP Units 3 and 4.

Based on the received questionnaires and visits, ROMATOM estimates that the involvement of the nuclear industry in Romania for the completion of Cernavoda NPP Units 3 and 4 may mainly include the following fields:

A. commissioning, operation, maintenance, and heavy water and nuclear fuel supply;
B. construction-erection services and related material supply;
C. mechanical, electrical and automation equipment from the nuclear and conventional part;
D. design, consultancy and research services.

A. commissioning, operation, maintenance and heavy water and nuclear fuel provision services;

- The provision of the commissioning and exploitation services of both units for the duration of the life cycle by Nuclearelectrica through the CNE Cernavoda subsidiary.

- The provision of the first nuclear fuel loading of both units, as well as the necessary fuel for the entire operation period by Nuclearelectrica through the FCN Pitesti branch, subject to the expansion of the current production capacity.
- The provision of the first heavy water loading for both units, as well as the completion demand during the entire operation period, by Heavy Water Plant sited at Drobeta-Turnu Severin.

B. the execution of construction-erection works; for the completion of the projects of Cernavoda NPP Units 3 and 4, can be entirely carried out by the identified Romanian companies, thus:

- The execution of the civil constructions, metallic structures, hydrotechical constructions, mechanical, electrical assembly works, AMC and telecommunications, the assembly of the heating, ventilation and air conditioning systems, sanitary installations, drainage for waste and rain water for the nuclear and conventional side of the nuclear power plant.
- The participation to the commissioning and performance tests based on the extensive experience from Cernavoda 1&2 Units.
- It must be underlined that during the construction-erection works, the management of the material assurance system is in force, involving the procurement and manufacture of the necessary materials for performing such activities (CNE SA, STIZO, GENERAL CONCRETE, HIDROCONSTRUCȚIA, ENERGOMONTAJ, TMUCB, ELCOMEX IEA, NIMB, UNIFY, ROMIB, IMUC, etc.)
- An aspect worth noting is the integrated management system aligned to the requirements in the nuclear field of the identified construction-erection companies, applied for a significant number of years. Considering also the experience of the associated staff in the field, we consider that this assembly of features is essential for the development of the Units 3 and 4 Project.
- The development of the construction-erection activities for the nuclear objectives is subject to special occupational health and safety rigors, imposed by both the national law and the various applicable codes and standards. This requirement is also familiar and currently applied by all the reviewed construction-erection companies.

C. The supply of mechanical and electric equipment for the nuclear and conventional part of the plant, among those which were already delivered also for Cernavoda Units 1 and 2. Among these, the following can be detailed:

- Steel structures as airlocks, shielding doors in the nuclear area (WALTER TOSTO-FECNE).
- Large and small heat exchangers, (POPECI UTILAJ GREU and UZUC). WALTER TOSTO-FECNE can also execute the calandria, as certain components of the Calandria vessel were already executed.
- The Bridge, Carriage and the maintenance platform of the Fuelling Machine (POPECI UTILAJ GREU, TEN).
- Auxiliary equipment and systems for the Fueling Machine, new, defect and spent fuel transport, transfer, discharge, storage and handling, , installation and maintenance of the reactivity control mechanisms and fuel channel closure, pneumatic control installations for airlocks and shielding doors (TEN).

- The feeder-header assembly and lower feeder unit, piping supports for the nuclear and conventional part of the plant, carbon and alloyed steel fittings for piping systems (VULCAN).
- The full scope of supply for bridges and hoisting equipment, including the 200/36 tons bridges, steel structures and hydromechanical equipment (PROMP-UMT).
- Vessels, tanks and heat exchangers from the nuclear and conventional parts of the plant, including deaerator, condensate tanks, condensers structures (UZUC, GRIRO, VULCAN).
- Panels, consoles from the main control room, C&I cabinets, Power Center and MCC power supply panels, local racks with devices, etc. (AUTOMATICA, ELECTROALFA Botoşani, ELCOMEX IEA).
- Power transformers and switch gear (ELECTROPUTERE Craiova, ELECTROALFA Botoşani).
- The components for the power cables laying and protection, as well as the measurement and automation systems, such as measurement diaphragms, spherical electromagnetic valves, direct pressure regulators, thermal resistances, thermocouples, level indicators, instrumental air filters (FEPA, ENERGOMONTAJ, ELCOMEX IEA, etc.).
- The manufacture in Romania of several heavy duty equipment, such as the the steam generators (GRIRO, POPECI UTILAJ GREU, VULCAN, WALTER TOSTO-FECNE), may be manufactured through cooperation between Romanian and foreign companies.
- In Romania there is the specialized industrial frame for the manufacture of high power turbo-aggregates (700 MW), which could provide the appropriate partnership for the supply and installation of turbo-aggregates (GENERAL TURBO).
- We must also underline the role that DOOSAN-IMGB might have through the delivery to other equipment suppliers of large cast parts for the manufacture of nuclear equipment, including forged components for the terminal fittings.

D. Provision of design, consultancy and research supporting services

- In cooperation with external partners, the Romanian design authority for nuclear and conventional parts of the project, RATEN/SITON can commit to provide the following: the drafting of the execution project details, including engineering support analyses, drafting the licensing supporting documentation (nuclear safety, environmental protection, utilities provision), including for obtaining licenses and authorizations, providing the technical engineering assistance and technical support services for the procurement activity.
- AMEC NUCLEAR Romania and TRACTEBEL, with the support of the companies from the international groups they are part of (Canada, Great Britain and Belgium) can provide independent consultancy services for the Owner or for the Design Authority and General Contractor; also, they are able to provide independent advisory services for the owner for drafting the support documentation for the nuclear licensing and for the risk assessment during the project implementation based on the recent extensive experience with Cernavoda Unit 1 re-licensing. These companies have the capability and flexibility to provide the above mentioned services, both by acting independently, as well as in a consortium with recognized international and/or Romanian companies.
- All the other companies involved in the research and design field, which answered to ROMATOM questionnaires have shown a firm interest in providing services for the execution of the Cernavoda NPP Units 3 and 4, based on the their capabilities and previous experience in the nuclear energy and physics field, heavy water production or uranium mining, as mentioned under paragraph 3.2 above, as follows: RAAN/ SCN, IFIN-HH, ISPE,

SERTO INVEST, ENERGOTECH, IPROCHIM, CELIN, ICCO şi GVC COMPLETE PROJECT.

ROMATOM estimates that the potential participation of the Romanian nuclear industry for the completion of the Cernavoda NPP Units 3 and 4 with the goods and services identified within this report, can be assessed at approximately 40-45% of the total project value, which represents an important contribution, with a special impact on the national economy.

Chapter 4

CONCLUSIONS

4.1. Romania's energy strategy supports the nuclear power development

The nuclear power represents a significant presence in the energy mix providing the coverage of the power demand of our national economic activities. Even from its beginnings (December 1996) and until today, when it covers approximately 20% of the power demand, the Romanian nuclear power has proved to be an efficient component of the national power industry, a safe source of sustainable energy and a method of optimizing the use of the internal primary energy resources.

The afore mentioned advantages led to the inclusion in Romania's power strategy of a significant growth of the nuclear power contribution, by completing the Cernavoda NPP Units 3 and 4 and by the future potential development of a new power plant.

The development of the nuclear power in Romania, by finalizing the Cernavoda NPP Units 3 and 4 Project, will contribute to the fulfillment of the main objectives of a new energy - environment policy of the European Union, also assumed by Romania, namely:

- the security of energy supply;
- the competitiveness on the internal and regional market;
- the sustainable development;
- the environmental protection and limitation of climate changes;
- the modernization and development of the energy sector.

The main challenges for the National Grid are the replacement of the non-efficient capacities having an expired life cycle, the integration of an even higher share of energy generated by renewable sources, the security of supply and the integration on the regional and European electricity market.

One of the main actions of Romania's energy strategy is concerned with the definition of a balanced energy mix, providing competitivity and security of supply, emphasising the use of internal resources, as coal, hydro potential, uranium ore and renewable energy resources.

Romania's energy strategy for 2011-2035 underlines the fact that until 2020, 5,554 MW from the installed power, representing 28% of the current capacity, will have to be decommissioned. According to the same strategy, the investments in generation units to fulfill the national forecast demand for 2020 include the completion of Cernavoda Units 3 and 4 (1,480 MW), the modernization of CE Turceni, Rovinari and Craiova (4,000 MW) and the pumping – storage hydro power plant Tarnita (1,000 MW).

The completion of Cernavoda NPP Units 3 and 4 is a priority project related to Romania's security of supply, with direct benefits in reaching the objectives of the national power strategy and maintaining a supportable power price for the end consumer.

4.2. Romanian capabilities for participating in the completion of Cernavoda NPP Units 3 and 4

The development of a national nuclear program and the completeion of a nuclear power plant involves the development of an adequate national infrastructure, including the provision of a favourable industrial and economic environment, able to sustain the project of the nuclear power plant and its subsequent operation for a period exceeding 50 years.

At the time when the decision to build the first nuclear power unit in Cernavoda was adopted, namely in the early 80's of the last century, Romania began the development of the necessary national infrastructure, including the development of a national nuclear industry, for supporting an important nuclear power program, involving the construction of several nuclear power units of the same type (CANDU 6).

The nuclear industry in Romania had a significant contribution to the completion of CNE Cernavoda Units 1 and 2, materialized in the delivery of mechanical, electric and automation equipment for the nuclear and classic part, as well as for the construction-erection works and participation to the commissioning tests.

Once Cernavoda Units 1 and 2 became commercial, the Romanian nuclear industry reduced its contribution to provide goods and support services for the operation and maintenance only, the nuclear commercial activities decreased, priorities were changed and the industry has oriented to other markets.

As a result of the shortage of orders from the internal market, many industrial units, especially from the component manufacturing industry, have oriented their production to export markets, both in the field of conventional energy as well as in the nuclear power plants field and they are suppliers agreed by large international companies. Also, many other disappeared.

Even in these circumstances, the report produced by ROMATOM in 2003 as well as the current report, underline the fact that a significant number of mechanical and electrotehnical component companies, as well as of construction-erection, engineering and research field have the availability and willingness to participate today in the completion of the Cernavoda NPP Units 3 and 4 Project.

To answer the even more sever technical and technological requirements, specific to the current industry progress, more and more Romanian economic operators are involved in the re-technologization and modernization of the existing equipment or in the procurement of new and more efficient equipment.

By cooperating with the Nuclearelectrica for the operation support and maintenance of Cernavoda Units 1 and 2, many Romanian companies, mainly from the construction-erection

and engineering field, have maintained and even developed their capabilities in the nuclear power field.

There is an obvious interest of the Romanian companies identified by ROMATOM within this report for the potential participation with equipment, material and services for the completion of the Cernavoda NPP Units 3 and 4, according to the specificity of their activities.

All respondents consider that the participation to the completion of the Cernavoda NPP Units 3 and 4 will offer them a unique opportunity for increasing their technical capabilities, due to the application of specific requirements, imposed by the nuclear power field (integrated management, quality assurance, etc.).

All the Romanian companies interested in participating in the completion of the project for Cernavoda NPP Units 3 and 4 apply efficient quality management systems, many of them implementing integrated management systems and maintaining their internal license for equipment and components supplier or services provider in the nuclear power field, according to the regulated process imposed by the National Commission for the Nuclear Activities Control (CNCAN).

Many Romanian companies participating in the ROMATOM report declared that they are willing to obtain/re-obtain the license as a goods and services qualified supplier for the nuclear power plants, according to the CNCAN regulations, provided there are internal orders for the nuclear power field.

According to the current report made by ROMATOM, based on the received questionnaires and site visits, it is estimated that the implication of the national industry in Romania to the completion of the Cernavoda NPP Units 3 and 4 Project might mainly include the provision of:

a) commissioning, operation, maintenance, and heavy water and nuclear fuel supply;
b) construction-erection services and related material supply;
c) mechanical, electrical and automation equipment from the nuclear and conventional part;
d) design, consultancy and research services.

ROMATOM estimates that the potential participation of the Romanian nuclear industry to the completion of the Cernavoda NPP Units 3 and 4 with the goods and services identified within this report can be assessed at approximately 40-45% of the total project value, which represents an important contribution, with a special impact on the national economy.

4.3. Impact of the Romanian companies participation on the national economy

The participation of the Romanian industry in the completion of Cernavoda NPP Units 3 and 4 would have a significantly favourable impact on the national economy, knowing the fact that the investments lead to the GDP increase, to the creation of new jobs, additional income to the state budget, which would have a multiplication effect in the economy.

The Romanian industry participation to the completion of the Cernavoda NPP Units 3 and 4 would mean attracting a part of the important financial resources entailed in the execution of such

projects to cover the manufacturing capacities in the country, with beneficial effects for the use of workforce and national economic growth. **According to the percentage estimates of the participation of the Romanian nuclear industry in the completion of Cernavoda NPP Units 3 and 4, we can also assess that the goods and services potentially contracted from Romania will have a value of approximatively Eur 1.6-1.8 billon.**

This participation can revigorate the direct investments in Romanian companies interested in participating in the completion of the Cernavoda NPP Units 3 and 4 project, the modernization and/or renewal of the production equipment, including the employment and training of new specialists in the nuclear energy and equipment manufacturing fields, becoming an important milestone in the re-industrialisation program of the Romanian economy.

According to the data provided by the companies responding to the ROMATOM questionnaire, the current number of jobs in the horizontal nuclear industry field in Romania is 8,300, to which another 7,800 jobs might be added in the conditions of receiving orders/contracts for the completion of Cernavoda NPP Units 3 and 4. In conclusion, it stands out that **a workforce capacity of 16,000 jobs can be assessed within the national industry for the completion of the Cernavoda NPP Units 3 and 4.**

If, for the 16,000 jobs created, we take into consideration a monthly retribution equal to the average economy wage, **the annual estimated income to the state budget is amounting to approximately lei 55 million (approximately Eur 12.5 million).**

The participation of the Romanian nuclear industry in the completion of Cernavoda NPP Units 3 and 4 Project could mean, first of all, the recovery and proper use of past investments, based on an imported know-how, for the facilities and production areas dedicated to components and equipment for CANDU 6 nuclear power units.

This participation would reconnect an important section of the Romanian industry to the top equipment production and services provision field designed for nuclear power plants, which would lead to the increase and consolidation of the technical level, including the competitiveness increase on the external markets.

Regarding the economic-financial potential of the companies identified by ROMATOM, reflected in the annual turnovers, the questionnaire analysis indicated the fact that for 2012 the turnover was approximately lei 2.4 billion (approximately Eur 550 million), the detailed situation being as follows:

a. The companies specialized in the manufacturing of components, equipment and other activities recorded a turnover of approximately lei 1.5 billion, in 2012.
b. The companies specialized in construction-erection and/or other services recorded a total turnover of approximately lei 640 millions, in 2012.
c. The companies specializing in engineering, research and consultancy recorded a total turnover of approximately lei 265 million in 2012.

4.4. Recommendations for the decision-makers

The completion of Cernavoda NPP Units 3 and 4 Project is a process which must provide trust to all potential participants (investors, technology providers , goods and services suppliers, public, etc.) **and this trust can only be offered by the Romanian Government, by continuing to support and assist the Romanian nuclear power program.**

ROMATOM considers that **the main issue with completing the Cernavoda NPP Units 3 and 4, as well as with other large energy projects in Europe and worldwide, is represented by providing the** necessary funding, in the form of equity and borrowed loans. In this context, it is necessary for the Romanian Government to identify the specific patterns and mechanisms necessary to solve this issue, including granting sovereign securities for external loans, to be borrowed for Cernavodă NPP Units 3 and 4 Project completion.

An intelligent lobby at European and international level is recommended by fiding new mechanisms able to facilitate the fundraising, including within the energy market and which would allow the implementation of large investment projects in the nuclear and classic energy field.

The participation of the Romanian industry in the completion of Cernavoda NPP Units 3 and 4, cannot be subject to a simple administrative measure of the Romanian state authorities. The representatives of the nuclear industry in Romania know and comply with the European conduct regulations for the free competitive market.

However, ROMATOM considers that Romania has a direct interest in promoting the involvement of the inland industry in this project, aiming for the important investment funds attracted for the project execution to be used to the largest extent possible within the national economy, with a direct contribution to the economic growth and employment and generation of additional income for the state budget.

The Romanian authorities will have to identify the appropriate measures for promoting the Romanian industry involvement in this project, which are probably similar to the ones practiced in other countries, even in the conditions imposed by the market economy. ROMATOM is convinced that these measures will be identified together with the project beneficiary S.C. ENERGONUCLEAR S.A. and the interested stakeholders

The investors, as well as the participants to the project implementation, should be oriented towards the internal market, through measures to stimulate the use of local opportunities, through official applications for the research and capitalization of the

technical and productive potential of the local market, as a recognition of the efforts made by Romania to complete this project.

ROMATOM considers that by applying a firm national investment policy related to the energy infrastructure, Romania has the opportunity to become a regional energy pole for South-Eastern Europe.

ANNEXES

Annex no. 1 LIST OF POTENTIAL PARTICIPANTS IDENTIFIED FOR THE ”CERNAVODA NPP UNITS 3&4 PROJECT”

Annex no. 2 LIST OF RESPONDENT COMPANIES FILLING IN THE QUESTIONNAIRE

Annex no. 3 TEMPLATE OF THE ROMATOM QUESTIONNAIRE PROVIDED TO THE POTENTIAL PARTICIPANTS IDENTIFIED FOR THE ”CERNAVODA NPP UNITS 3&4 PROJECT”

Annex no. 4 DETAILS REGARDING THE POTENTIAL PARTICIPANTS TO THE ”CERNAVODA NPP UNITS 3&4 PROJECT”

Annex 1

LIST OF POTENTIAL PARTICIPANTS IDENTIFIED FOR THE "CERNAVODA NPP UNITS 3&4 PROJECT"

A) COMPANIES SPECIALIZED IN MANUFACTURING OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES

1. AUTOMATICA
2. AVERSA
3. CNU
4. COMES SA
5. COZMIRCOM SA
6. DOOSAN- IMGB
7. ELECTROCONTACT
8. ELECTROALFA
9. ELECTROPUTERE
10. FEPA Barlad
11. GRIRO
12. GENERAL TURBO
13. MATE FIN
14. METABET
15. MICO ELECTRO SRL
16. MECROSYSTEM SRL
17. POPECI UTILAJ GREU
18. PROMEX Brăila
19. PROMT –UMT
20. RAAN/ROMAG
21. RETRASIB SA
22. RETROM Pașcani
23. ROMENERGO
24. ROSEAL
25. SILVER TRADING SRL
26. SNN/FCN Pitesti
27. TEN Bucharest
28. UTI SYSTEM SA
29. UTON SA
30. UZUC
31. WALTER TOSTO-FECNE
32. 24 IANUARIE Ploieşti

B) COMPANIES SPECIALIZED IN CONSTRUCTION-ERECTIONAND/OR SERVICES:

33. AEDIFICA CARPAȚI S.A
34. ARGOS
35. BIS –NIMB
36. COMPCONTROL
37. CONSMETAL
38. DUAL MAN
39. ELCOMEX IEA
40. ENERGOMONTAJ SIEA
41. ELECTROPROIECT S.A
42. GENERAL CONCRETE
43. GREEN HIDROFOR SRL
44. IMSAT
45. INCAS
46. NIMB CONSMETAL
47. NUCLEAR NDT SRL
48. RAC SRL
49. ROMIB S.A
50. SMART S.A
51. STIZO NUCLEAR
52. TMUCB
53. TIAB
54. UNIFY S.A

C) COMPANIES SPECIALIZED IN ENGINEERING, DESIGN, RESEARCH, CONSULTANCY SERVICES

55. AMEC NUCLEAR România
56. CELIN
57. ENERGOTECH
58. GVC COMPLETE PROJECT
59. ICCO
60. ICSI Râmnicu Vâlcea
61. IFIN-HH
62. INCA Bucharest
63. IPROCHIM
64. ISPE
65. ONET Technologies România
66. RAAN/SCN
67. RAAN/SITON
68. ROMELECTRO S.A
69. SERTO INVEST S.A.
70. TRACTEBEL
71. TRAFO CONSULT SRL

Annex 2

Annex no. 2 LIST OF RESPONDENT COMPANIES FILLING IN THE QUESTIONNAIRE

A) COMPANIES SPECIALIZED IN FABRICATION OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES

1. AUTOMATICA
2. AVERSA
3. DOOSAN- IMGB
4. ELECTROALFA
5. ELECTROCONTACT
6. ELECTROPUTERE
7. FEPA Bârlad
8. GRIRO
9. GENERAL TURBO
10. MATE FIN
11. METABET
12. PROMT –UMT
13. POPECI UTILAJ GREU
14. RETROM Pașcani
15. ROSEAL
16. SNN/FCN Piteşti
17. TEN Bucharest
18. UZUC
19. VULCAN
20. WALTER TOSTO–FECNE

B) COMPANIES SPECIALIZED IN CONSTRUCTION-ERECTION AND/OR SERVICES:

21. BIS -NIMB
22. COMPCONTROL
23. DUAL MAN
24. ELCOMEX IEA
25. ENERGOMONTAJ SIEA
26. GENERAL CONCRETE
27. IMSAT
28. INCAS
29. NIMB CONSMETAL
30. RAC
31. STIZO NUCLEAR
32. TMUCB
33. TIAB
34. UNIFY S.A

COMPANIES SPECIALIZED IN ENGINEERING, DESIGN, RESEARCH AND CONSULTANCY SERVICES

35. AMEC Nuclear Romania
36. CELIN
37. ENERGOTECH
38. GVC COMPLETE PROJECT
39. ICCO
40. ICSI Râmnicu Vâlcea
41. IFIN
42. IPROCHIM
43. ISPE
44. RAAN/SITON
45. RAAN/SCN
46. SERTO INVEST S.A.
47. TRACTEBEL

Annex 3

TEMPLATE OF THE ROMATOM QUESTIONNAIRE PROVIDED TO THE POTENTIAL PARTICIPANTS IDENTIFIED FOR THE "CERNAVODA NPP UNITS 3&4 PROJECT"

QUESTIONNAIRE

1. Is your company interested in submitting an offer for the equipment/material/services for the Cernavoda NPP Units 3 and 4 project and for what (you can indicate the field or provide a detailed list of the supplies you wish to offer)

a) ☐- **YES**
b) ☐- **CONDITIONED**
c) ☐- **NO**

2. What experience do you have in the field you wish to submit an offer for; do you have licenses, know-how and which are these?

Experience	**Licences/Know-how**	**Field**
a) ☐- **≥ 5 YEARS**	**a)** ☐- **ONE**	
b) ☐- **< 5 YEARS**	**b)** ☐- **SEVERAL**	
c) ☐- **NONE**	**c)** ☐- **NONE**	

3. Does you company possess a CNCAN license for activities in the nuclear field and which are the fields you are licensed for:

a) ☐ -**HOLDS** (license number .....)
b) ☐ -**HELD** (license number;.....)
c) ☐ -**DOES NOT HOLD ANY LICENSES**

4. Which quality management system do you apply within your company and which certificates do you have for this system?

a) ☐ -**INTEGRATED SYSTEM** (QUALITY, ENVIRONMENT, OCCUPATIONAL HEALTH)
b) ☐ -**UNIQUE SYSTEM (**QUALITY)
c) ☐ -**OTHER SYSTEMS**

5. Did your company participate in another nuclear project, which one and with what supplies?

a) ☐ -**YES** Please provide details:
b) ☐ -**NO**

6. Please provide a characterization of the quantitative and qualitative workforce envisaged by you for the offered supply; to what extent does it have the qualification and experience for nuclear activities field.

- There is authorized personnel ☐ -**YES** ☐ -**NO**

The answer is YES:

- Number of authorized personnel:
- Fields in which the personnel is authorized:
- Authorization validity:

7. Please make an estimate if new jobs are created by accepting your offer

a) ☐ **-YES (please make an estimate)**

b) ☐ **-POSSIBLY (please make an estimate)**

c) ☐ **- NO**

8. Which are the economic-financial coordinates of your company, related to:

- Turnover:
- Net profit:
- Number of employees:
- Debts:
- Risk provisions:

(only the public information will be submitted)

NOTE: Any details related to the requested information are more than welcomed.

Annex 4

DETAILS REGARDING THE POTENTIAL PARTICIPANTS IN "THE CNE CERNAVODA NPP UNITS 3&4 PROJECT
Suppliers of mechanical and electrical equipment, construction-erection, and design, engineering and consultancy services

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE (Nuclear Power Plant) Supplier	Name of supplies for Unit1/Unit2 Possible participation in Unit3/Unit4	Authorization number/ Validity of CNCAN (National Commission for Control of Nuclear Activities) authorization
COMPANIES SPECIALIZED IN THE MANUFACTURING OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES						
1.	**AUTOMATICA S.A.**	**Manufacturing and supply of class 3 services** for - equipment for low and medium voltage power distribution - equipment and systems for complex automation of industrial processes - industrial electronic equipment - weighing and batching equipment - metallic constructions - protection coatings painted in electrostatic field.	YES	YES	Panels, consoles from the main control room, C&I cabinets, Power Center and MCC power supply panels, local racks with devices, local control; C&I for access airlocks etc. Control unit of the ventilation system in the turbine building.	12-053/ 17.10.2014
2.	**AVERSA**	**Class 3 production and services**, nuclear and non-nuclear pressure pumps, repairs of pumps and pump components **Design** of nuclear and non-nuclear pressure pumps, repairs of pumps and pump components	NO	YES	Technical water pumping assemblies; Pumps from the facilities of the conventional part of the plant, except the condensation pumps and feed pumps.	**FS**=12-027/ 24.06.2014 **P=**12-026/ 24.06.2014
3.	**DOOSAN- IMGB**	**Manufacturing of cast and forged heavy parts**, forged and cast components for power generation, nuclear power industry, cement industry, mining industry, naval constructions and general machinery constructions.	YES	NO	Can deliver large cast parts for the manufacture of nuclear equipment, including forged components for the terminal fittings	N/A but it is willing to obtain an authorization, should there be orders for nuclear products.
4.	**ELECTROALFA International**	**Class 3 manufacturing** for panels, low and medium voltage equipment, control systems, automation command and direct and alternating current distribution, supply of services for nuclear installations.	YES	NO	Different power transformers and switch gear, panels, consoles from the main control room, C&I cabinets, Power Center and MCC power supply panels, local racks with devices, etc.	**F=**12-001/ 22.02.2014
5.	**ELECTROCONTACT**	**Class 3 and 4** production of inductive detectors, optoelectronic detectors, rotary switches, command and signaling devices, stroke limiters, disconnectors, separators, transformers, electrical equipment, electrical apparatus.	NO	YES	Subsystems such as: micros, contactors, capsulated switches, bipolar sockets, junction boxes, crossing cables glands, junction boxes.	N/A but was authorized until 1999.

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Name of supplies for P1/P2 Possible participation in P3/P4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN THE MANUFACTURING OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES						
6.	**ELECTROPUTERE S.A.**	**Design of** power transformers, electrical engines and generators, electrical apparatus, tools, devices and test equipment, repair technologies, revisions and technology upgrade for power transformers, engines and electrical engines. **Class 3 manufacturing** of power transformers, electrical engines and generators, assembly, commissioning, technical assistance	NO	YES	Electrical transformers for power evacuation and supply of internal services; Equipment for the electrical switch yard, electrical transformers for auxiliary facilities.	**P=** 10-051/18.12.2012 **F=** 10-050/ 18.12.2012
7.	**FEPA Bârlad**	**Class 3 manufacturing** in the nuclear field, of valves, pressure, temperature and level transducers, converters, pressure regulators, accessories for automation systems Design, production and sale of electronic and pneumatic instruments for the control of processes.	NO	YES	Production of valves, pressure, temperature and level transducers, pressure regulators, electrical, pneumatic and mechanical valves.	10-040/ 14.09.2012
8.	**GRIRO S.A**	**Class 1 production** of pipes and piping elements, pressure-retaining equipment, various metallic structures, services related to the production and installation of manufactured products, designed for nuclear **installations.** **Design** for proprietary products, such as pipes and piping elements, pressure-retaining equipment (container, heat exchangers, columns, basins, reservoirs, filters, basins with agitators), various metallic constructions.	NO	NO	Can deliver vessels, tanks and heat exchangers for the nuclear and conventional parts of the plant, including deaerator, condensate tanks, condensers structures Also, can produce several heavy duty equipment, such as the the steam generators in cooperation with foreign companies	**F=**11-052/ 20.09.2013 **P=**12-038/ 12.08.2014
9.	**GENERAL TURBO**	**Construction and installation:** mechanical installation and maintenance of non-nuclear equipment and systems, installation of electrical circuits, insulation works, mechanical installation and maintenance of rotating equipment - turbine, generator, machine room, modernization, tests and verifications. **Manufacturing** of turbo generators of up to 700 Mw, with saturated steam, electrical engines, pumps.	YES	YES	Has the capability, based on Cernavoda 1 & 2 experience to manufacture the saturated steam turbo-aggregates (700 MW), and can provide the appropriate partnership for the supply and installation of turbo-aggregates Also can deliver condenser cooling water pumps.	**CM=**12-039/15.08.2014

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Name of supplies for P1/P2 Possible participation in P3/P4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN THE MANUFACTURING OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES						
10	**MATE FIN SRL**	**Class 3 production and services,** equipment and subsystems for the monitoring of radioactivity, interfaces for the adjustment and modernization of radioactivity monitoring equipment, services for the management of radioactive waste products with average and low activity, pre-treatment and treatment of liquid and solid radioactive waste products, conditioning and description of liquid and solid radioactive waste products with medium and low activity. **Construction and installation**, assembly of equipment for radiation monitoring, assembly, connection and commissioning for nuclear radiation monitoring equipment for air, water, electrical facilities, civil and industrial buildings, waterproofing. Thermal insulations, sanitary appliances, painting works, dyeing works, wall coating works, floors, low voltage and weak current electrical systems, heating systems, ventilation, air-conditioning, automation systems, telecommunications, **IT.**	YES	YES	Activities of supply, production and services for radioactivity monitoring equipment and subsystems.	**FS**= 12-061/ 21.112014 **CM**=12-060/ 21.112014
11.	**METABET CF SA.**	**Class 4 manufacturing and services,** for the execution of casted and mechanically processed parts, production of elements, metallic bridges for railways and roads, metallic constructions, concrete elements for constructions, lifting installations, electrical panels for the modernization and repair of hoisting machines, non-destructive control with Rx, US, LP, PM.	NO	NO	N/A	FS=11-011/ 03.03.2013
12.	**PROMT S.A-UMT**	**Class 3 manufacturing and services**, cranes up to 400 tons, moving cranes on rolling frames with or without rails, special construction cranes, mechanical and electrical repairs and maintenance services for hoisting machines. Design of moving cranes on rolling frames with or without rails, special construction cranes.	NO	YES	Can provide the full scope of supply for bridges and hoisting equipment, including the 200/36 tons bridges, steel structures and hydro mechanical equipment	**FS=**12-013/ 13.04.2014 **P**=12-014/ 13.04.2014

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Name of supplies for P1/P2 Possible participation in P3/P4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN THE MANUFACTURING OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES						
13.	**POPECI UTILAJ GREU**	**Production** : of carousel lathes, hydraulic press**,** metallurgic equipment**,** (power equipment, outlet encasings**,** encasings for gas turbines, earthwork equipment, mining equipment, mechanical subsystems). **Welded constructions** **Services**: Repairs of machinery and accessories; - Static and dynamic balancing; - Thermal or vibratory stress relieving; - 3D modelling, assembly or individual components; - execution of complete specific projects (conceptual design and details); - FEA analysis (finished element analysis) - optimization of components and subsystems.	NO	YES	Can deliver the Bridge, Carriage and the maintenance platform of the Fuelling Machine, and large and small heat exchangers, except steam generators Also, can produce several heavy duty equipment, such as the steam generators in cooperation with foreign companies	N/A but it is willing to obtain an authorization, should there be orders for nuclear products.
14.	**RETROM Pascani**	**Production** : flow transducers and counters, temperature transducers, level transducers, direct temperature regulators, direct pressure regulators, direct level regulators, electromagnetic valves, taps, components specific to nuclear plants, components for railway cars and locomotives **Services** Mechanical processing on machinery with numeric control, chip removal processing and hot and cold plastic deformation; Casting under pressure of non-ferrous materials; Rubber vulcanization and injection of thermoplastic and thermo set materials, Protective coating with paint and electrochemical coating, Welding, Spark metal working process	NO	YES	Components from the production range for Units 1 and 2	**It held the CNCAN authorization 03-052 for production activities in the nuclear field.**
15.	**ROSEAL S.A**	**Class 1 manufacturing and services,** mechanical sealing and spare parts in the field of mechanical sealing, execution of piping components through mechanical processing. **Design**, mechanical sealing, spare parts in the field of mechanical sealing, piping components.	YES	YES	Mechanical sealing and spare parts in the field of mechanical sealing, repairs for condensation pump sealing.	**FS**=11-070/ 13.12.2013 **P**=11-071/ 13.12.2013

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN THE MANUFACTURING OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES						
16.	**SNN/FCN Piteşti**	Production of CANDU nuclear fuel	NO	YES	It delivers CANDU nuclear fuel for both units.	12-043/ 17.09.2014
17.	**TEN Bucharest**	**Supply** for nuclear power installations, fuel handling system equipment, containers, components of the primary circuit, supports, seismic dampers. **Class 1 manufacturing and services** for thermal treatments, galvanic coating, physical-chemical analyses, mechanical tests, non-destructive control of nuclear installations.	YES	YES	The Bridge, Carriage and the maintenance platform of the Fuelling Machine. Auxiliary equipment and systems for the Fuelling Machine (new, defect and spent fuel transport, transfer, discharge, storage and handling). Installation and maintenance of the reactivity control mechanisms and fuel channel closure, pneumatic control installations for airlocks and shielding doors; equipment, panels for instrumentation; tools and devices for maintenance; pipe supports and seismic dampers; containers for shielding and transportation; technical assistance services for installation and functional testing.	**F**= 12-015/ 09.04.2014 **CM**= 12-016/09.04.2014
18.	**UZUC S.A**	**Manufacturing and services** for mechanical equipment, pressure vessels, heat exchangers, reservoirs, agitators, filters, ion exchanging columns, basins with agitator, metallic compensators, metallic structures, bearings, pipes and piping elements, level indicators for the nuclear part and the conventional part of the plant.	NO	YES	Production of pressure vessels, large and small size heat exchangers, tanks, filters, ion exchanging columns, for the nuclear and conventional parts of the plant, heavy water steam recovery installations, including deaerator, condensate tanks, condensers structures.	**FS=**11-059/ 02.11.2013

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN THE MANUFACTURING OF COMPONENTS, EQUIPMENT AND OTHER ACTIVITIES						
19.	**VULCAN S.A.**	**Manufacturing of containers,** pressure-retaining pipes class 1, 2, 3 and class 4, 5, 6 piping elements, equipment, feeder pipes, thermal and mechanical equipment, equipment for the management of fuels and oil, water treatment installations.	NO	YES	Delivery of Unit2 feeder-collector systems, thermal and mechanical equipment, supports, assembly units, steel structures, miscellaneous. It can deliver feeder-header assembly and lower feeder unit, piping supports for the nuclear and conventional part of the plant, carbon and alloyed steel fittings for piping systems, vessels, tanks and heat exchangers for the nuclear and conventional parts of the plant, including deaerator, condensate tanks, condensers structures. Also, it can produce several heavy duty equipment, such as the steam generators in cooperation with foreign companies.	N/A but it is willing to obtain an authorization, should there be orders for nuclear products.
20.	**WALTER TOSTO FECN**	**Manufacturing of components and items** for nuclear installations, such as steam generators**,** and components related to the heat transfer in the primary circuit. For the secondary circuits, it produces HP/ LP preheaters for water supply, heat exchangers, HP condensers, deaerators and water supply reservoirs, equipment and personnel airlocks etc.	NO	YES	FECNE delivered large vessels with thick walls for the primary heat transport system (pressurizer, deaerator-condenser, heavy water tanks), steel structure for access airlocks (equipment and personnel), tanks for the emergency water supply system, tanks, deaerators and pre-heaters (low and high pressure) for the feed water system. Potential for calandria fabrication and steam generators (in cooperation). Also, it can produce several heavy duty equipment, such as the steam generators in cooperation with foreign companies.	N/A but it is willing to obtain an authorization, should there be orders for nuclear products.

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN CONSTRUCTION-ERECTION ACTIVITIES AND/OR OTHER SERVICES						
21.	**BIS NIMB S.A.**	**Manufacturing of metallic structures** and parts, assembly of installation and equipment.	YES	YES	Metallic structures and parts, assembly of installations and equipment.	N/A
22.	**COMPCONTROL**	**Class 3 services** for: - examinations through non-destructive control, - analysis of metallic structure integrity, - interventions with closures and sleeves for the steam generators and heat exchangers	YES	YES	Development of activities in the controlled area and non-destructive examinations, both inside and outside the controlled area.	**S**=12-056/10.11.2014
23.	**DUAL MAN SRL**	**Construction and installation for metallic structures and various parts**	NO	NO	N/A	**CM=**12-009/ 18.03.2014
24.	**ELCOMEX IEA**	**Supply**: low, medium and high voltage electrical equipment, protection and automation equipment, pressure vessels, hoisting machines, ventilation installations, air-conditioning and sanitary equipment. **Construction and installation** of low, medium and high voltage electrical equipment, illumination equipment, earthing equipment, protection equipment against atmospheric tension, voice and data networks, hoisting machines, piping systems, metallic equipment and constructions, prefabricated products and bolsters. **Class 3 manufacturing and services, metallic structures specific to electrical installation,** junction boxes, boxes for electrical panels, piping supports, repairs of electrical equipment, instrumentation, pressure vessels, pressure pumps, preservation of equipment and electrical eqpm't. **Design:** systems, installations, equipment and services for the electrical part of nuclear installations, with voltage of up to 400 KV, 0.4 - 400 KV power networks, installations and services for building-related technological and mechanical installations, processes automation, authorized repairs on hoisting machines. **Usage of software products:** design and analysis of structures and components with safety functions, data transfer among computer programs.	YES	YES	It can deliver and install panels, consoles from the main control room, C&I cabinets, Power Center and MCC power supply panels, local racks with devices, etc. Main partner of CNE Cernavoda (Nuclear Power Plant); most of the activities in the company fields of activity are carried out at CNE, based on an outsourcing contract for certain CNE activities.	**A**=11-044/ 04.08.2013 **CM**=11-067/ 23.11.2013 **FS=**11-066/ 23.11.2013 **P=**11-045/ 30.07.2013 **SW**=12-030/ 22.02.2014

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN CONSTRUCTION - ERECTION ACTIVITIES AND/OR OTHER SERVICES						
25.	**ENERGOMONTAJ S.A –SIEA**	**Construction and installation, electrical and mechanical installation works** **Design** of products and accessories required for the assembly of electrical and automation installations for piping systems and thermal-technical equipment. **Supply** for electrical systems. **Class 4 manufacturing and services,** products and accessories required for the assembly of electrical and automation systems, services for electrical and automation installations.	NO	YES	It can deliver and install components for the power cables, protection equipment, as well as the measurement and automation systems, such as measurement diaphragms, spherical electromagnetic valves, direct pressure regulators, thermal resistances, thermocouples, level indicators, instrumental air filters.	**CM**=10-062/ 18.12.2012 **P**= 10-063/ 18.12.2012 **A**=10-064/ 18.12.2012 **FS**=11-053/ 6.09.2013
26.	**GENERAL CONCRETE SRL**	**Construction and installation:** buildings or building parts, roads, hydro technical constructions, installation works, drilling and injections, waterproofing works. **Class 4 manufacturing and services;** manufacturing of metallic structures, including metallic surfaces, repairs and maintenance of metallic structures, decontamination, maneuvering and storage of products, transport of goods on the premises of CNE Cernavodă. **Supply**: of construction materials for installations.	YES	YES	Decontamination services in nuclear buildings, product preservation, construction activities.	**CM**=12-052/ 10.10.2014 **FS**=12-058/ 24..11.2014 **A**=11-046/ 09.08.2013
27.	**IMSAT S.A**	**Construction and installation,** mechanical equipment, electrical systems and measuring and controlling equipment. **Class3 manufacturing and services**, metallic structures, LOCAB elements, pipe racks, supports, illumination and earthling systems, electrical power distribution equipment.	YES	NO	Assembly works on electrical and automation installations, for the nuclear part of the nuclear power plant.	**F**=11-036/ 27.06.2013 **CM**=11-035/ 23.06.2013
28.	**INCAS Bucharest**	**Class 4 services** for HSSA hydraulic dampers, repairs, reconditioning, testing and maintenance, included in class 4, for nuclear installations.	NO	NO	N/A	**S**=12-023/ 20.05.2014

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN CONSTRUCTION - ERECTION ACTIVITIES AND/OR OTHER SERVICES						
29.	**NIMB CONSMETAL SRL**	**Manufacturing and installation,** metallic structures, beams, vertical and horizontal wind braces, roof cleats, platforms, supports for equipment, pedestals, guard rails, beams and rolling frames for cranes, prefabricated installations, gas piping and supports, sanitary appliances, heating systems, fire extinguishing equipment, venting, air-conditioning, assembly and repairs of hoisting machines. **Class 2 manufacturing and services** for pipes, piping elements, metallic structures and prefabricates for ventilation systems, air-conditioning, heating systems, sanitary appliances, gas, fire extinguishing equipment, maintenance and inspection of equipment and technological installations. **Supply of** metal sheets, pipes, profiles, installation benches **Design** of civil/industrial, nuclear and non-nuclear buildings	NO	YES	Manufacturing and installation of metallic structures and ventilation installations, air-conditioning, sanitary and gas systems, fire extinguishing equipment in the nuclear steam part and the conventional part of the plant.	**CM**=12-063/ 08.12.2014 **FS**=12-064// 08.12.2014 **A**=12-065/ 12.08.2013 **P**=11-051, rev.1/ 11.09.2013
30.	**RAC SRL**	**Class 3 services, non-destructive control** with penetrating radiations, ultrasounds, penetrating liquids, magnetic dusts, visual control, and mechanical tests for nuclear installations.	NO	YES	Services for non-destructive control Rx Gama, US, LP. PM.	**S=**12-011/ 25.03.2014
31.	**STIZO NUCLEAR S.A.**	**Manufacturing and installation**, concrete structures and structural elements, reinforced concrete or masonry, consolidations, repairs, epoxy, elastic linings, special de-contaminable sealing.	NO	YES	Epoxy protection works, elastic linings, de-contaminable sealing.	**CM**=11-033/ 22.01.2013
32.	**TMUCB S.A.**	**Class 3 manufacturing for** welded reservoirs of up to 60 cubic meters, welded constructions of carbon steel, metallic structures, elbows, reductions. **Manufacturing and installation,** piping systems, metallic structures, non-nuclear static and dynamic equipment**.**	NO	NO	Assembly works for mechanical equipment and piping systems in nuclear auxiliary installations of the plant.	**F=** 12-015/ 09.04.2014 **CM**=12-016-/ 09.04.2014
33.	**TIAB S.A.**	**Manufacturing and installation execution and technological tests** for commissioning of electrical systems, automation systems, security systems, heating, ventilation, air-conditioning, sanitary appliances, gas, fire safety in the nuclear field.	NO	NO	N/A	**CM=**11-050/ 13.08.2013

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN IN CONSTRUCTION - ERECTION ACTIVITIES AND/OR OTHER SERVICES						
34.	**UNIFY CO LTD SRL**	**Manufacturing and installation:** epoxy and polyurethane floors, resin injections in concrete structures, passive fire protection, painting works on metallic structures, wood, plastic materials, indoor and outdoor finishing.	YES	YES	It carried out activities inside and outside the controlled area.	**CM=**11-031/ 08.05.2013
COMPANIES SPECIALIZED IN ENGINEERING, DESIGN, RESEARCH AND CONSULTANCY SERVICES						
35.	**AMEC NUCLEAR RO**	**Technical** consultancy and assistance for nuclear safety services and licensing support for nuclear installations, stress analyses for nuclear and non-nuclear pipes, in cooperation with AMEC NSS Canada and AMEC NUCLEAR UK, it covers the entire range of design **and engineering services**, both as operation support, as well as for new nuclear power projects in Canada, Great Britain and on third party markets. **Usage of software products** for design, analysis and calculation of nuclear, thermal-hydraulic safety, stress analysis, etc. applicable to nuclear power plants.	YES	YES	Risk analyses, stress and vibration analysis for CNE Cernavodă systems. Periodic Safety Review for Unit1, in cooperation with AMEC NUCLEAR UK and update of the Final Safety Analysis for Unit 1. ”Owner Engineer - OE” (2009-2010) independent consultancy within the AMEC consortium, Iberdrola Engineering and TRACTEBEL, in the pre-project stage, for Units 3 and 4, site studies. It can provide OE / Independent Client’s adviser services, design – engineering in partnership with the Design Authority, technical assistance.	**C**=13-002/ 20.01.2013
36.	**CELIN SRL**	**Research-Development and Design for**: systems, installations, equipment and services related to the electrical part of the nuclear power plant/nuclear installations with voltages of up to 400 kv, automation of industrial processes, low voltage current systems (fire prevention and extinguishing, public addressing, telephones, computer networks, access control), systems, installations, subsystems and services for technological and mechanical systems related to buildings, outdoor networks.	NO	NO	N/A	**CDP=**12-028 / 25.06.2014

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN ENGINEERING, DESIGN, RESEARCH AND CONSULTANCY SERVICES						
37.	**ENERGOTECH**	**Technical consultancy/assistance:** For studying the options and choosing the optimal solutions during the design and/or investment works in the relation with the entities involved in the project and/or investment, in order to select and coordinate the adjustments of the control-protection, monitoring, measurement etc. systems. Design (engineering) • control-protection systems (machining included); • measurement systems (machining included); • monitoring systems (machining included); • protocols for tests and complex samples at the equipment supplier, after machining (FAT) • protocols for tests and complex samples commissioning	YES	YES	Supply activities and services for electrical systems.	**A=** 12-047/14.09.2014 **P=** 11-010/18.12.2013
38.	**GVC COMPLETE PROJECT**	**Design activities,** studies for radiological risk assessment, feasibility studies for the development of new uranium mining facilities, mining prospects.	NO	NO	N/A	P=11-028/11.04.2013
39.	**ICCO ENERG SRL**	**Design** for: indoor and outdoor electrical systems for civil and industrial constructions, aerial and underground connecting pipes, aerial and underground power lines, transformation station, and electrical stations belonging to the units, electrical and air-conditioning **automation systems.** **Class 4 services** for indoor and outdoor electrical systems for civil and industrial buildings, complete services for all the designed activities. **Manufacturing and installation** for all the designed activities.	NO	NO	N/A	**P=**11-018/ 03.04.2013 **S=**11-019/ 03.04.2013 **CM=**11-020/ 03.04.2013

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN ENGINEERING, DESIGN, RESEARCH AND CONSULTANCY SERVICES						
40.	**ICSI (National Research & Development Institute of Cryogenics and Isotopic Technologies)- Rm. Vâlcea**	**Performing activities for heavy water detritiation installation** **Class 3 manufacturing** of heavy water gauges, engineered fills and catalyzers for thermal and mass exchange, water distilled through isotope separation, turbo-molecular pumps, cryogenic thermometers, pure heavy water containers, column spools, isotope exchange columns and related maintenance equipment. **Class 3 services:** analysis of gases and mixtures of gases from nuclear plants, technical assistance for commissioning of equipment executed and delivered, cleaning the spools of heavy water re-concentration installations, heavy water certification, hydraulic and sealing tests for components, systems, equipment of the nuclear installations, monitoring of environment factors, physical, chemical and isotopic analyses in the influencing area of nuclear plants.	YES	YES	The detritiation installations at CNE Cernavodă were executed as a result of the cooperation with ICSI.	
43.	**IFIN-HH**	**Decommissioning of** VVR research reactor and operation of the spent nuclear oil storage. **Notified laboratory** of tests for environment samples, assessment of tritium, carbon -14, lead -210, strontium -90, uranium, thorium content.	YES	NO	N/A	IFIN-HH 11-007/ 28.01.2013 LI 010-2010/17.10.2013
42.	**ISPE (Institute for Studies and Power Engineering)**	**Design and technical assistance, consultancy** related to studies for systems in the conventional part of nuclear installations, radioactive depollution of liquid effluents resulted from uranium and thorium mining, reconditioning of pits, geological research mines or extraction mines of uranium and/or thorium. **Usage of software** products for the design, research and development of structures, systems and equipment for nuclear installations.	NO	YES	Design and technical assistance services for the conventional part of the nuclear-electrical plant.	**P**=11-061/ 23.112013 **SW**=11-062/ 23.11.2013

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN ENGINEERING, DESIGN, RESEARCH AND CONSULTANCY SERVICES						
43.	**IPROCHIM S.A.**	**Design** of machinery, equipment, installations, technological and utilities networks, electrical force and illumination systems, automation, constructions and general plan, environment protection works, technical assistance, consultancy and technical inspections, installation of equipment and technological installations, technical-economic assessments and analyses.	NO	NO	N/A	**P**=11-030/ 23.04.2013
44.	**SERTO INVEST S.A.**	**Design** for: process technological systems, mechanical, electrical and automation equipment and components, industrial construction, technical analyses and studies for the improvement of functional performances of systems and equipment, technical assistance for assembly and commissioning of equipment and technological systems, supply of qualified personnel for design activities.	NO	NO	N/A	**P=**12-040/ 03.09.2014
45.	**RATEN/SITON**	**Design and engineering** • Support studies and documentation for customer decision-making and marketing • Prefeasibility and feasibility studies • Technical-economic assessment studies • Optimization of production profile • Studies for the site selection • Conceptual studies for modernization and safety improvement • Environment impact studies • Risk assessment reports • Waste product management programs • Requests for offers and offers assessment reports **Basic design documentation** **Licensing and safety documentation** **Technical assistance** **Consultancy** **Research and development**	YES	YES	Design and technical assistance services Engineering subcontractor of the AECL/ANSALDO consortium, during the Unit 1/Unit 2 investments implementation. Support consultancy services for the operation of Units 1 and 2. AECL subcontractor during the pre-project period, at Units 3 and 4. It can provide the following: the drafting of the execution project details, including engineering support analyses, drafting the licensing supporting, documentation (nuclear safety, environmental protection, utilities provision), including for obtaining licenses and authorizations, providing the technical engineering assistance at and technical support services for the procurement activity	

Annex 4

No.	Company Name	Field of Activity	ROMATOM Member	SNN/CNE Supplier	Scope delivered for Units 1 & 2 Possible participation in Units 3 & 4	Authorization number/ Validity of CNCAN authorization
COMPANIES SPECIALIZED IN ENGINEERING, DESIGN, RESEARCH AND CONSULTANCY SERVICES						
46	**RATEN/SCN**	The main fields of activity are the following: • Physics of reactors and nuclear safety; • Irradiation tests; • Post-irradiation verifications of materials and nuclear fuel; • Technologies of irradiation and radioisotopes; • Nuclear materials and corrosion; • Assessment of nuclear fuel performances; • Tests outside the reactor; • Definition and treatment of rad waste products; • Electronics, instrumentation and control; • Verifications and qualification tests for devices, components and nuclear equipment; • Protection against radiations, environment protection and civil defense; • Design of nuclear equipment; • Nuclear prototypes; • Technological transfer; • Technical quality control and non-destructive examinations; • Metrology and computer technology; • Quality management.	YES	YES	Consultancy in the field of reactor physics, fuel performances, first criticality monitoring, production of installations for the detection of fuel defects.	
47.	**TRACTEBEL Engineering GDF Suez**	**Consultancy** in two distinct divisions: **Power division** - design of thermal power plants, electrical power plants, wind power plants etc., power efficiency, lines, transformation stations and consultancy in the field**.** **Infrastructure division** - design of roads, bridges, railways, water works (damns, harbors etc.), civil construction works and consultancy in the field.	YES	NO	”Owner Engineer” (2009-2010) independent consultancy within the AMEC consortium, Iberdrola Engineering and TRACTEBEL, in the pre-project stage, for Units 3 and 4. It can provide OE / Independent Client’s adviser services, design – engineering in partnership with the Design Authority, technical assistance	**P=** 11-069/ 19.12.2013