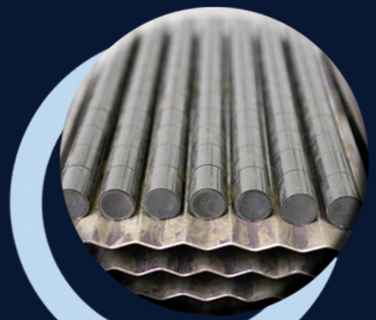
ROMANIAN NUCLEAR INDUSTRY CAPABILITY, CERNAVODA NPP UNITS 3 AND 4 PROJECT
SEPTEMBER 2018
2013 UPDATED ROMATOM STUDY



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ROMANIAN ATOMIC FORUM Association (ROMATOM)
- Summary -

The ROMANIAN ATOMIC FORUM Association (ROMATOM) is a Romanian legal entity of private law, independent association of national level representation, non-profitable or lucrative, non-governmental, apolitical entity made-up of Romanian and/or foreign legal person members.

The purpose of this Association is to promote the peaceful use of nuclear energy in Romania and the national nuclear program, to coordinate the activity and promote the interests of its members - nuclear utility, suppliers for goods and services for the Romanian nuclear sector, research and design organizations, as well as to coordinate all activities required by the Association's affiliation to FORATOM - European Atomic Forum.

The General Meeting for ROMATOM incorporation was held on January 10, 2001 in the presence of the representatives of 16 founding members - legal entities and two non-profit associations, namely Nuclear Union of Romanian Industry (UNIR) and Romanian Nuclear Energy Association (AREN). Based on the hearing report issued by Bucharest District 1 Court of Law after the hearing of May 3, 2001, ROMATOM has acquired legal personality, on June 19, 2001 obtaining the Certificate of Registration in the Registry of Associations and Foundations with Record Office of Bucharest District 1 Court of Law.

The impatient to become part of the European Nuclear Group has determined the Initiative Committee representatives to apply for FORATOM adhesion, while ROMATOM was still under its establishment phase. FORATOM reply was a favorable one, thus ROMATOM becoming member of this European Forum as of December 13, 2000.

At that time a long lasting collaboration was established with the Permanent Representation of Romania to the European Union, this collaboration being in place also in the present days and yielding beneficial outcomes in the promotion of national nuclear industry interests, as well as for the industry assertion at European level.

Since its incorporation and until present days, ROMATOM has maintained its initial profile, working constantly towards a peaceful use of nuclear energy in Romania and supporting the national nuclear program, as well as coordinating the actions and promoting the interests of its

members, at the same time ensuring the coordination of all activities required by its participation in the activities of FORATOM.

At this moment, ROMATOM includes 33 members with active presence of interested in the national nuclear industry.

Among the Association's major actions, the following may be listed:

- Cooperation with the Joint Committee of Romanian Parliament - European Parliament during the European Union pre-adhesion interval;
- Introduction of the Romanian nuclear program to the European institutions, by organizing events, site visits and meetings with the national industry representatives, with a consistent support from FORATOM, mainly when Romania applied for the EURATOM loan required for CNE Cernavodă Unit 2 completion;
- Assessment of Romanian nuclear industry capability by the Working Group for National Nuclear Program between 2003 – 2004, publishing the essay titled "Romanian nuclear industry capability to participate in the execution of Unit 3 CNE Cernavodă with equipment and material supplies" based on the replies received from 36 trading companies out of the 53 contacted companies;
- Organizing events in Strasbourg where the European Parliament members have attended in order to support the restart of works on Units 3 and 4 from Cernavodă:
- Cooperation with other similar associations of the nuclear sector, like for instance the collaboration with the Bulgarian Atomic Forum – BULATOM in order to gain support for the referendum that took place in January 2013 with regard to the continuation of the nuclear program in Bulgaria.
- Actively participating in the public consultations initiated by the European institutions with regard to nuclear energy topics:
    - the Romanian nuclear sector opinion in relation to the support mechanism for the new Hinkley Point C nuclear project from UK, sent to the European Commission in year 2014
    - the opinion on a possible state aid SA.38454 (2015/C) (ex 2015/N) related to the building of a new nuclear power plant in Paks, Hungary, sent to the European Commission in year 2016
    - FORATOM summarized comments regarding the draft of European Commission Communication "Nuclear Illustrative Programme" completed in year 2017
    - reply to the public consultation organized in year 2017 by the European Commission with regard to Horizon 2020 (H2020) Research Programme
- Join during 2015 to the "Nuclear for Climate Initiative" launched by the French Society for Nuclear Energy (SFEN).
- Active presence in the Romanian and international mass-media, through press releases and opinions like the following ones:
    - the joint message ROMATOM, AREN, AREN YG and WIN, addressed to Romanian and Romanian delegation to COP 21/2015 Paris
    - press release regarding the enactment of European Parliament resolution of 15 December 2015, "Towards a European Energy Union" (2015/2113(INI)),

acknowledging the nuclear technology contribution to ensuring energetic security and at the same time complying with the targets for greenhouse gas emissions reduction

- press release related to the approval of the Report on Units 3 and 4 of nuclear power plant (CNE) Cernavodă, granted at the meeting of the Supreme Council of National Defense (CSAT) held on May 27, 2016
- press release related to the approval granted in 2016 by the European Commission to funding instruments for the construction of two new units at Paks II nuclear power plant in Hungary, as well as for the 10 year expansion of the life cycle of Tihange 1, Doel 1 and Doel 2 reactors in Belgium
- press release concerning the celebration of 60 years since the establishment of the European Atomic Energy Community (EURATOM) by signing the EURATOM Treaty in Rome on March 25, 1957
- positionpaper issued in 2017 with regard to the support for the project of ALFRED 4th generation reactor by FALCON Consortium (Fostering ALfred CONstruction) between ANSALDO Nucleare - Italy, ENEA - Italy and RATEN/ICN from Romania
- press release welcoming Romania's adhesion to the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD) in year 2017
- opinion concerning the TV show titled "Appeal to ethics: the danger of Kozloduy nuclear power plant", of 30.12.2017, requesting a fair, leveled and transparent approach of information related to the nuclear industry

– Administration of "ROMATOM Oficial" Facebook page

– Activities supporting the nuclear industry and research in Romania, by signing the memo of Understanding between Research and Education Partnership for Advanced Nuclear Systems (CESINA), including RATEN/ICN and Romanian Atomic Forum Association (ROMATOM), in order to develop Alfred IV generation reactor

– Active contribution to the completion of nuclear section of the draft for Romanian Energy Strategy din 2016-2030, November 2016

On European level, ROMATOM representatives are involved in most working groups of FORATOM, even ensuring the presidentship of some of these groups, and are also included in FORATOM general Assembly, as well as the Association's Board of Directors, during the last four mandates.

On national level, the Romanian Atomic Forum considers that the completion of Cernavoda NPP Units 3 and 4 represents a priority of the Romanian Energy Strategy. Under these circumstances, it is ROMATOM duty and obligation to update the inventory of existing potential of the Romanian nuclear industry, including members and non-members of the Association, given the major challenge related to the continuation of the nuclear program in our country for the stated purpose of informing the decision-makers and public on the results of this assessment process. At the same time, ROMATOM plans to explain and quantify the social and economic advantages of local industry participation to the completion of this project.

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For the contribution to this study update, ROMATOM is grateful to all trading companies which have answered to the questionnaire sent by the Association, as well as to the members of ROMATOM Working Group established for this purpose: Adrian Panait (Coordinator), Mihaela Stiopol, Teodor Chirica, Gheorghe Lucaciu and Sorin Pătrășcoiu.

THE MESSAGE
OF ROMANIAN NUCLEAR INDUSTRY ADDRESSED TO THE DECISION-MAKERS WITH REGARD TO THE COMPLETION OF CNE CERNAVODA UNITS 3 AND 4 PROJECT

The development of a national nuclear program and the construction of a nuclear power plant means to develop and maintainan adequate national infrastructure, including ensuring a favorable economic environment able to sustain the nuclear power plant design and its subsequent operation for at least 50 years.

As soon as it was decided to build the Cernavodă nuclear power plant, at the beginning of the '80s, Romania has started to develop the national infrastructure required to support such an ambitious program of nuclear energy, including 10 – 12 nuclear power units of CANDU 6 type, both at Cernavoda and at other sites, based on the licenses and technology transfer acquired by the Romanian State. Thus, the Romanian nuclear industry was able to provide a major contribution to the completion of Units 1 and 2 from CNE Cernavodă, materialized in design-research services, supply of mechanical, electric and automation equipment for the nuclear and classical part of the project, as well as the execution of construction and installation works and participation in the commissioning tests.

Currently, in the absence of similar large projects, the industry has resized its contribution to the delivery of products and services required to operate and maintain the two nuclear units or turned its attention towards other areas, including on the external markets.

Even under these circumstances, ROMATOM studies conducted in year 2013 and this year have highlighted the fact that a significant number of companies dedicated to mechanical and electrical equipment fabrication a, as well as construction – erection works, consulting, engineering and research are still willing and able to participate in the completion of Units 3 and 4 of CNE Cernavodă (the "**Projec**t").

Based on the conclusions of this study it is estimated that the potential participation of Romanian nuclear industry in the completion of this Project may be appraised at **about 1.0...1.6 billion Euro**, that is between 25 and 40% of the total value of the Engineering, Procurement, Construction and CommissioningContract, but in any case not less than 25%.

At the same time, the study has identified the fact that the current number of jobs in the Romanian supply chain, which can be assigned to the Project, is of about 11.000, with the option to add another 8.000 new jobs which may be established in case of receiving orders/contracts for the Project completion, thus **reaching a maxim number of about 19.000 jobs dedicated to Project completion**, taking into account only the industry directly involved in execution, without tier two or three suppliers.

Given that this Project completion is a process which must offer reliability to all categories of participants (investors, technology, products and service suppliers, public, etc.), the Government of Romania – in its capacity of main promoter of this project – must ensure such **reliability by continuous support and aid for the Romanian nuclear energy program and connected supply infrastructure,** fully complying with the national and European legislation related to the rules of market and free competition.

That is why ROMATOM, as an association representative for the Romanian nuclear sector and member of the European Atomic Forum - FORATOM, believes that it is required to develop an **Industry Strategy**, able to identify the measures by which the State may secure its participation

and strengthen the role of national supply chain within this Project, in an integrated context of the entire energy sector, with the end objective to reduce the investment costs of the Project but, at the same time, with multiple effects on the industry at large and on Romania's reindustrialization, identifying the following directions:

- Support of **research – applied development sector,** in partnership with the industry, developing suitable technologies for the nuclear program, as well as investments in technical and digital education, and innovation **having as main purpose to reduce the investment costs of this Project**, as well as of developments related to advanced nuclear power technologies;
- Development of dedicated **education programs**, investingon technical and digital education, strengthening the technical education and re-training system to match the current industry requirements, identifying the measures able to attract and train the labor force, encouraging on the job training after graduation, in an effort **to retain skilled labor force**, as well as to increase the competitiveness of national industry;
- **Infrastructure**: support of investments in transport infrastructure, encouraging the electrical or hydrogen-driven vehicles, investments to encourage increased domestic electricity consumption and replace conventional fuels for heating and cooking, as well as investments in IT infrastructure;
- **Business environment:** establishing partnerships between the Government and the industry, dedicated to increasing the efficiency, facilitating the financing of these activities, **as well as directing the investors towards the domestic market by incentives to use local opportunities,** capitalizing the technical and production capabilities of the local market, under competitive circumstances;
- **Communities:** encouraging and supporting local strategies, promoting local capabilities, including those from disadvantagedareas, providing development funds for interconnection between localities.

It is our opinion that the **Romanian State has a direct interest in promoting the participation of local industry in this Project,** aiming to ensure that the important financial resources to be attracted by the Project are directed to the national economy as much as possible, directly contributing to economic growth, reindustrialization, labor force employment and obtaining additional revenues to the state budget.

We are convinced that the industry associations and trade associations of the energy sector can be trusted partners of the State in achieving such strategic approach.

Specially referring to the Cernavoda Units 3 and 4 Project and to the support to be provided by the Romanian State, it must rely mainly on the **identification of models, financial sources and specific mechanisms required to ensure the Project financing**, but also on maintaining and developing the appropriate supply chain, fully complying with the provisions of the applicable legislation on public debt, respectively GEO no. 64/2007 as amended, at the national level, and according to the provisions of EC Communication on the implementation of Art. 87 and 88 of EC Treaty related to state aid in the form of guarantees.

- **Initiating a smart lobby at the level of European institutions in order to promote the approaches to attract funding sources**, including on the electric power market, able to allow the implementation of large investment projects in the nuclear and conventionalenergy sector.
- **Identifying the willingness of EURATOM** to participate in co-funding this Project, its presence providing a greater reliability for investors and sponsors, similar to the model used in funding Unit 2 of CNE Cernavodă.

- Facilitating the **access to national and international funds** for Romanian companies, such funds being required to retrofitting and upgrading the industry with general impact on the national economy;

Examples of large nuclear projects in Europe – like Hinkley Point C, rom Great Britain, Fennovoima, Finland and Paks II, Hungary are showing that acting with commitment and solid arguments, the measures undertaken by the governments have led to avoiding the distortion of electric power market by funding such projects according to the European rules on state aid.

It is the Romanian Atomic Forum – ROMATOM's opinion that the participation of Romanian nuclear industry in the Project completion will mean, mainly, putting forward the investments made in the past, based on imported *know-how*, as well as the production facilities dedicated for the manufacture of components and equipment for CANDU 6 type reactors. To this is added the recovery of the past investment made in the production of heavy water and existing structures at the site, which are estimated at about 1 billiard Euro.

The completion of this Project has every chance to revitalize the direct investments in Romanian companies, which are interested to participate to the Project finalization, modernizing and /or renewing the production equipment, including by employing and training new experts in the field of nuclear energy and equipment manufacture. Thus is generated the possibility **to maintain and develop a strong supply chain**, concern that we see also at other European Union Member States, not necessarily only for the nuclear sector. Such a concern also brings a national security guarantee and reconnection of an important part of the national industry to the peak area of equipment production and delivery of services to nuclear power plants, which will lead to the raising and strengthening of the technical level of the Romanian industry, part of a national re-industrialization policy, while contributing to increased its competitiveness in foreign markets.

2018

Romanian Nuclear Industry capability to participate in the Project for Units 3 and 4 of CNE Cernavodă

This document is an update of ROMATOM study "Romanian Nuclear Industry capability to participate in the Project for Units 3 and 4 of CNE Cernavodă", published in May 2013.

SEPTEMBER 2018

ROMATOM STUDY. ROMANIAN NUCLEAR INDUSTRY CAPABILITY TO PARTICIPATE IN THE PROJECT FOR UNITS 3 AND 4 OF CNE CERNAVODĂ, REVISION 1

EXECUTIVE SUMMARY

ROMATOM Study on the Romanian nuclear industry capability to participate in the Project for Units 3 and 4 of CNE Cernavodă, which is on its third edition, was executed between April-August 2018. The Study is updated under the circumstances where Romania has two ongoing investment projects with significant economic and social impact, namely the Project of Units 3 and 4 and Retrofitting on Unit 1, the Study being focused mainly on inventorying the technical, material and human resource capabilities of Romanian industry in the case of Units 3 and 4 Project.

This Study was performed on 42 companies that answered to the questionnaire sent by ROMATOM (representing a majority percent of 60% of the total number of identified companies), with a total turnover of 2.73 billiard Lei (about 590 million Euro) and an approximate number of 11.000 employees, as follows:

A. 11 companies specialized in providing project management services, engineering services, design, research and consultancy services;
B. 21 companies specialized in manufacturing equipment and parts, including production of nuclear fuel, as well as other activities;
C. 10 companies specialized in construction-installation, commissioning activities and other adjacent activities.

Based on the Study it is estimated that the potential participation of Romanian nuclear industry in the completion of Project Units 3 and 4 Cernavodă, with the products and services specified in the said Study, can be assessed at about 1.0...1.6 billiard Euro, which would be somewhere between 25 and 40% of the total value of the Contract for Engineering, Procurement, Construction and Commissioning (EPCC), thus representing a major contribution with a significant impact on the national economy and its industrialization. The actual value of this contribution depends on the value of EPCC Contract but may not be below 25%.

Also, it is estimated that the local industry is able to ensure a maximum number of 19.000 jobs dedicated to the completion of Project for Units 3 and 4 (11.000 existing jobs, plus the option to add 8.000 jobs created in case of receipt of orders).

ROMATOM feels that the execution of this Project for Units 3 and 4 may lead to a revitalization of direct investments in Romanian companies which are interested to participate in the Project completion, by updating and /or renewing the production equipment, including by employing and training new experts in the field of nuclear energy and equipment manufacture. As such, we see the possibility to reconnect a major part of national industry to the top level of equipment manufacturing and service supply for nuclear power plants, which will lead to an increase and strengthening of technical level, that is part of a national reindustrialization policy, as well as to an increase of competitiveness on external markets.

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Chapter 1

QUICK VIEW OVER THE NUCLEAR ENERGY IN THE WORLD AND THE EUROPEAN UNION, INCLUDING ROMANIA

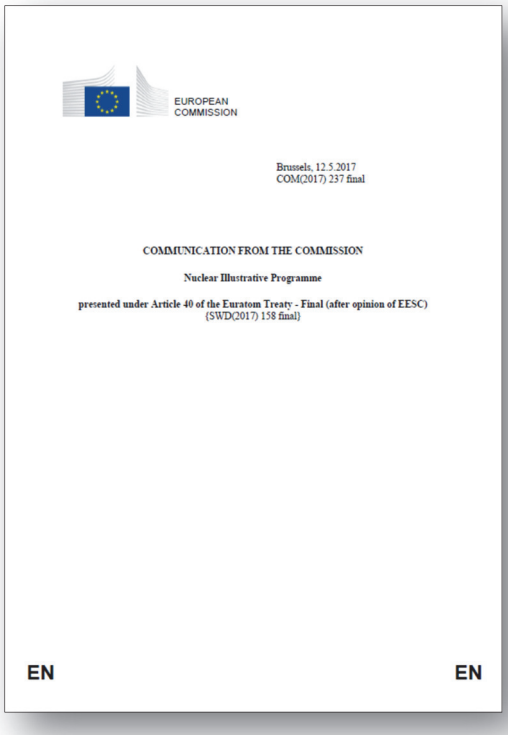
Today, the nuclear power is covering at **worldwide level** about 11% of the electricity production, relying on the 450 nuclear reactors in service in 30 countries, ensuring about 30% of carbon-free electric power production. During 2016, new 10 GW have been installed at the nuclear power plants, while 60 nuclear reactors were being under construction. In the context of nuclear power role in carbon emission reduction, OECD experts[1] feel that as of 2016 is required to double the increase rate of installed capacity of nuclear power plants, to "*Capacity additions of 20 GW per year are needed to meet the 2 DS targets*", observing that we are still far away from this target. That is why, OECD recommends to their Member States to "p*rovide clear and consistent policy support for existing and new capacity that includes nuclear power in clean energy incentive schemes and that encourages its development in addition to other clean forms of energy*", at the same time observing that "*projected nuclear growth remains strongest in Asia, as China released a new five year plan to more than double its 2015 capacity by 2020 …"*

OECD/International Energy Agency Reports are showing that "*The global power sector can reach net-zero CO2 emissions by 2060 under the 2DS scenario. This would require a scaled up deployment of a portfolio of technologies, including 74% of generation from renewables (including 2% of sustainable bioenergy with CCS [BECCS]), 15% from nuclear, 7% from fossil fuelled power plants with CCS, and the remainder from natural gas fired generation*"[2].

There are currently 14 Member States in the **European Union**that operate 126 nuclear reactors, delivering 26% of the electricity production. They are covering 50% of clean energy production in the Union, with specific emission of about 12gCO2/kWh per the entire life cycle, similarly to the emissions generated by wind farms or about 30% of solar energy emissions. Five Member States have 8 nuclear reactors under construction and 9 Member States are taking into account the construction of new nuclear reactors. In the context ageing of the existing "fleet", the Member States having nuclear power plants under service are giving major attention to the extensionof life cycle of their reactors, this being the case of 8 Member States.

[1]Tracking Clean Energy Progress 2017, Energy Technology Perspectives 2017. Excerpt. Informing Energy Sector Transformations, 6 June 2017,OECD/IEA, https://www.iea.org/publications/freepublications/publication/TrackingCleanEnergyProgress2017.pdf

[2]"Energy Technology Perspectives 2017, Catalysing Energy Technology Transformations", Executive Summary, June 2017, OECD/IEA,https://webstore.iea.org/download/summary/237?fileName=English-ETP-2017-ES.pdf


EUROPEAN COMMISSION

Brussels, 12.5.2017
COM(2017) 237 final

COMMUNICATION FROM THE COMMISSION

Nuclear Illustrative Programme

presented under Article 40 of the Euratom Treaty - Final (after opinion of EESC)
{SWD(2017) 158 final}

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Figure 1. Nuclear Illustrative Programme, European Commission Communication, 2017

Nuclear Illustrative Programme (PINC) 2017, regularly published by the European Commission, as an obligation arising from the EURATOM Treaty, noted that the EU nuclear power will maintain an installed capacity of 95 – 105 GW until 2050, in the conditions about 50 reactors will be closed by 2025. PINC is forecasting a total volume of new investments in nuclear fuel cycle between 660 and 770 billiard Euro by 2050. The demand of investments estimated for retrofitting and life expansion of the eligible reactors to be of about 47 billion Euro.

Currently, the European Union is confronted with a paradox! On one hand, the Union is still the world leader as of the installed nuclear capacity, running a solid nuclear supply chain for the entire nuclear fuel cycle, but on the other hand this capacity is declining and no new reactors have been commissioned during the last 10 years. Meanwhile, the EU nuclear supply chain is subject to a strong competition from the nuclear industries from Russia, China and South Korea!

In addition, not all EU Member States acknowledge the role of nuclear energy as source of low carbon emissions electricity, promoting an unbalanced energy mix, focusing on exaggerated renewable sources combined with natural gas, also a source of CO_2 emissions. at about 60% of those produced by coal.

However, it is worth noting recent developments in the nuclear field at the level of the European Commission, referring to Communication "A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy[3]", delivered on November 28, 2018, which remarks that by 2050, **renewables** will deliver than 80% of electricity, "together with a **nuclear power share of ca. 15%**, this will be the **backbone of a carbon-free European power system**".

[3] https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_en.pdf

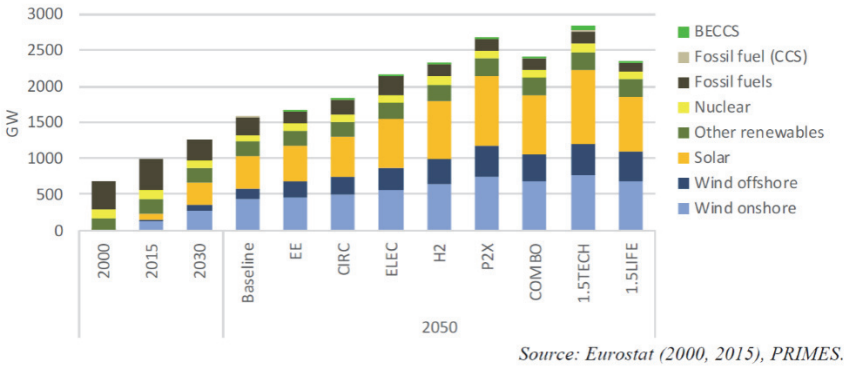

Figure2. EU power generation capacity evolution by 2050 , under different scenarios (A Clean Planet for all)

Also, the IPCC Special Report[4] consider that "Nuclear power increases its share in most 1.5°C pathways with no or limited overshoot by 2050" by mid-century.

The European nuclear sector, through the voice of the European Atomic Forum – FORATOM, is advocating for a balanced energy mix which, at least under the difficult climate conditions of the last years - seen during summer as well as during winter - proved to be the solution for ensuring energetic security, a fact fully confirmed also in the case of Romania. Selecting its energy mix is the right of every Member State, provided that the climate targets are being achieved, respectively the percentages for renewable energy and energy efficiency targets, taking into account that nuclear power is the only technology related to which the relevant forecasts are not indicating long term changes of its weight in the energy mix.

The study "FORATOM Pathway to 2050: Role of nuclear in a low-carbon Europe[4]", commissioned by FORATOM and presented to the media on November 22, 2018, also referred by the Commission Communication "A Clean Planet for all", reached similar conclusions.

There is an extensive discussion regarding the competitiveness of nuclear power plants, currently being strongly impacted by the electric power "*market failure*", resulted from an exaggerated, unbalanced and discriminatory policy, supporting only certain energy sources with low carbon emissions, thus excluding the nuclear power and carbon capture and storage technologies.

[4]GLOBAL WARMING OF 1.5 °C. An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty, October 6, 2018, https://www.ipcc.ch/site/assets/uploads/sites/2/2018/11/SR15_Chapter2_Low_Res.pdf

	2000	2010	2020	2030	2040	2050
INDICATIVE LEVELISED COST FOR NON-RES TECHNOLOGIES (€/MWh)						
Pulverized Coal	48	59	62	69	75	80
Supercritical Lignite	51	55	56	55	54	54
CCGT	66	92	84	91	95	97
Pulverized Coal CCS post combustion	91	106	98	106	109	114
Gas Combined Cycle pre-combustion	84	118	107	109	112	113
Nuclear 3rd gen	**84**	**97**	**92**	**86**	**82**	**82**
INDICATIVE LEVELIZED COST FOR RES TECHNOLOGIES (€/MWh)						
Wind Offshore	173	152	123	105	95	90
Wind onshore	99	103	89	80	75	72
Solar PV - South of Europe	383	124	77	65	59	55
Solar PV - North/Central Europe	505	172	108	95	89	84
Solar Thermal	434	135	255	192	165	157
Geothermal	109	108	99	92	86	81
Large Hydro	135	135	135	135	135	135
Small Hydro	110	110	108	106	104	101

Table 1. Levelized cost of power generation of new plantsevolution by 2050 (v. "EU Reference Scenarios 2016, Energy, Transport and GHG emissions trends to 2050", https://ec.europa.eu/energy/sites/ener/files/documents/ref2016_report_final-web.pdf)

The above table is showing the good position held by nuclear units in comparison to other technologies, under nondiscriminatory conditions, without establishing a carbon tax, at an annual capital cost of 7.5% in case of annualoperation conditions similar to the current ones.

In **Romania**, there are currently in service two CANDU 6 type nuclear reactors, owned and operated by the National Company Nuclearelectrica SA (SNN) at Cernavodă NPP, and they h, very wellrated at international level. Nuclear energy contributes with about 18-20% to the domestic electric power production, generating about 33% of electric power with low carbon emissions. Nuclear fuel production is carried out by SNN at the Nuclear Fuel Plant (FCN Pitești), also owned and operated by SNN, covering the entire demand of nuclear fuel. A series of malfunctions in the field of uranium exploitation and processing have determined, for a certain period, the use of mainly imported uranium during the last couple years.

The draft of Romanian Energy Strategy 2018 – 2030, with the perspective of year 2050 includes the completion of Units 3 and 4 of CNE Cernavodă as one of the four **strategic investments of national interest**, this project being one of the "optimal solutions for covering the deficit of electric power production capacity predicted for 2028-2035, when several existing production capacities a reaching the end of their service life". Under the "optimum scenario" contemplated by the Strategy, electric power production from nuclear will increase until 2030 at 17,4 TWh (22,5% out of the mix), once Cernavoda NPP Unit 3 will be operational. Once Unit 4 will be operational, by 2035, nuclear electricity generation will reach 23,2 TWh, and nuclear will generate about 40% of low carbon electricity. The Strategy is also highlighting the significance of achieving on time the life cycle expansion of Unit 1 from CNE Cernavodă, an operation which will require the entire nuclear expertise available in Romania, underlining the importance of maintaining a solid national supply chain, including the profitable activities in the mining and milling processing and in the nuclear fuel production.

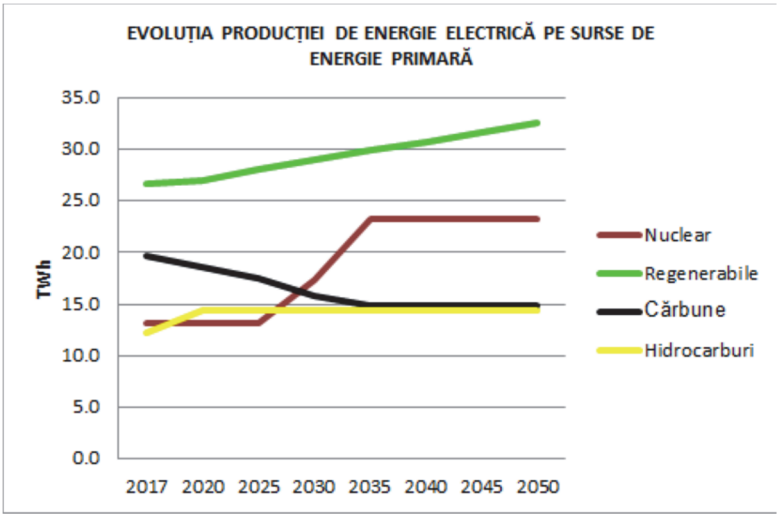

Figure 3. Evolution of net production of electric power - nuclear power, renewable energy, coal and hydrocarbons (Draft of Romanian Energy Strategy 2018 - 2030, with the perspective of year 2050)

Chapter 2

POTENTIAL OF THE ROMANIAN SUPPLY CHAIN FOR CERNAVODA UNITS 3 AND 4 PROJECT COMPLETION

2.1. Assessment methodology

This assessment of Romanian supply chain potential for participation in the Project completion is an update of ROMATOM review carried out in 2013. The methods and steps applied to achieve this assessment have been defined within the Working Group of ROMATOM, using a methodology similar to the one previously employed, in 2013.

The assessment methodology has taken into account the following assumptions:

- The national industry potential was assessed in terms of its possible participation in the Engineering, Procurement, Construction and Commissioning - EPCC Contract related to the Project completion
- The national effort has not taken into account the existing structures or heavy water for the first load, already produced, which represents capital contribution of Nuclearelectrica and/or Romanian State to the Joint Venture – JV that will complete the Project.
  Companies manufacturing metal and other materials, sub-assemblies and completion parts were also not taken into account, assuming that the equipment manufacturers and construction - installation companies have, as current practice, the management of ensuring the materials by procuring and manufacturing all components required for the product/service supplied. No doubt, a significant contribution of Romanian industry to the sub-supplier chain would generate a visible national added value, as compared to the situation often seen where a series of national companies are using imports, many of the local traditional sub-suppliers missing, but such an analysis will be required in a future phase of ROMATOM Study supplementation.
  The following steps must be complied with:

i. Identifying 68 companies possible participating in the Project completion, as opposed to 71 in 2013, based on the following information sources:

   a. List of companies with valid CNCAN license for works/services in the nuclear field;
   b. List of certified suppliers of S.N. NUCLEARELECTRICA/CNE Cernavoda;
   c. Information received by the Working Group from responding companies

It is important to specify that we contacted companies that are both members and non-members of ROMATOM, the ROMATOM membership nor being a relevant criterion for inclusion in/exclusion from the analysis. The list of identified companies is presented in Annex 1.

ii. Drawing-up a questionnaire – see the template in Annex 2 - which was sent to the 68 identified companies as potential suppliers of equipment, works and services required to participate in the Project completion. This questionnaire was also sent as an annex to the Letter of Intent from ROMATOM, explaining the purpose of this

action and requesting an answer to the questionnaire within a timeframe reasonable to review and interpret the replies.

iii. Reviewing and interpreting the results based on the replies given to the questions in the provided questionnaire.

2.2 Findings established after reviewing the existing situation

After sending the mentioned questionnaire, 42 companies as opposed to 47 in 2013, representing about 60% of all identified companies, have answered to ROMATOM questionnaire. Their answers were the basic data used in ROMATOM Working Group assessments. In addition, there were used some data supplied by SNN with regard to the companies included in the list of agreed suppliers involved in operation and maintenance activities at Units 1 and 2 of CNE Cernavodă.

Responding companies are also listed in Annex 1 and have been classified under the following categories (market by "x" on the column 3):

A 11 companies specialized in providing project management and engineering services, design, research and consultancy services;

B 21 companies specialized in manufacturing equipment and parts, including production of nuclear fuel, as well as other activities;

C 10 companies specialized in construction-installation, commissioning activities and other adjacent activities.

Note: Technologies for Nuclear Energy State Owned Company (RATEN) is included on list (A) with its two branches, CITON and ICN. Nuclearelectrica, covering manufacture services – FCN (nuclear fuel) included in list (B), as well as commissioning services - CNE, included in list (C) is specified twice in Annex 1, but the overall estimation of turnover for these activities is aggregated.

Annex no. 3 shows details related to i) the capabilities and qualifications of companies that replied to ROMATOM questionnaire; *ii)* the business area relevant for this Project, *iii)* the capacity of SNN/CNE supplier, *iv)* supplies delivered at Units 1 and 2 and *v)* recent participation in the activities of Project preliminary phase.

Elements like turnover, number of employees, detailed business areas/programs and/or performance rate in the execution of contracts signed with CNE Cernavodă are not included in Annex no. 3, due to confidentiality reasons. However, the information received based on the replies to ROMATOM questionnaire have been used for some global assessments when drawing-up this document.

2.3 **General aspects** established for the three activity categories taken into account:

A. Romanian companies specialized in **project management, engineering, research and consultancy** may take-up a significant share in supporting the design, engineering and project management for this Project given the experience acquired during the execution of Units 1 and 2, service support, as well as involvement in other nuclear projects from the country. The following relevant contribution can be listed:

Among the design companies which provided design and consultancy services for the execution and commissioning of Units 1 and/or 2 of CNE Cernavodă, some also ensuring the design services during the service of these units, we may list CITON/RATEN, IPROCHIM, KINECTRICS NUCLEAR ROMÂNIA (former AMEC), MATE-FIN…….

CITON/RATEN in partnership with AECL (subsequently CANDU Energy) has worked on the execution of security analyses required to obtain the European Commission Opinion on the Project (26 October 2010), as well as the assessment of the condition of project-related existing structures;

The consortium made up of TRACTEBEL ENGINEERING (leader), IBERDROLA ENGINEERING and KINECTRICS (former AMEC) *has ensured the* owner engineer services during the preliminary phase of the Project, between 2009 - 2011, Tractebel and Kinectrics (former AMEC) mainly using the local engineering resources;

ICSI Rm. Vâlcea together with its subcontractors (CELIN, CITON/RATEN, KINECTRICS) have finalized the feasibility study and conceptual design of the clastic system for CNE Cernavodă;

SC SOLACE MINING SRL has provided consultancy services to the National Uranium Company, in the area of mining and preparation of uranium ore.

The nuclear research and development area in Romania has the required capabilities and experience, being able to continue and contribute to the pursuit of the nuclear programme. ICN/RATEN has provided services for component testing, post-irradiation examinations and technical support in the commissioning of Units 1 and 2 of CNE Cernavodă, ICSI Rm. Vâlcea has provided research, consultancy and design services for the production of heavy water, as well as during the execution of Units 1 and 2 of CNE Cernavodă, being currently involved in the management of execution and commissioning works for tritium separation system. IFIN-HH has ensured the support required for on-site dosimetry measurements, calibration, radiation measurement devices, etc.

However, we can say that in the absence of significant investments in the nuclear field, the last 10 years have been extremely difficult in terms of drawing major projects and preserving the quality and numeric capacity of human resources specialized in such

activities. Similarly to the companies active in the manufacture of nuclear industry equipment, some specialized engineering/consultancy companies have turned towards the export (in case of those part of international groups, via the other companies in their group) or towards areas adjacent to the nuclear field (environment, electric power generation, waste-to-energy, etc.).

B. The Romanian supply chain, specialized in the **manufacture of equipment and components** for the nuclear field, which could have a contribution to the Project execution, is made-up of companies with sufficient experience in their line of business (exceeding 5 years). Some of these companies have directed their production towards the export, in collaboration with other worldwide known companies. Many companies included in this category have the know-how, approvals or different manufacturing licenses, such as:

- AUTOMATICA has Siemens license for the manufacturing electric panels;
- DOOSAN-IMGB Romania is manufacturing sub-assemblies for nuclear equipment (reactor vessel, steam generator, etc.) for its parent company in the Republic of Korea;
- FCN/SNN is ensuring the production of nuclear fuel for Units 1 and 2 of CNE Cernavodă, based on CANDU license;
- GENERAL TURBO can supply its own products based on know-how licenses, subsequently assimilated and developed;
- GRIRO is the certified supplier for more than 45 well-known companies such as Alstom, Linde, Siemens, ABB, Mitubishi, Hitachi etc.;
- POPECI UTILAJ GREU is licensed by Siemens and General Electric for turbine housing of medium, low and high pressure and is the certified supplier of Siemens, General Electric, Skoda, ABB, AIRBUS, Caterpilar etc.
- ROSEAL has the know-how in the field of mechanical sealing;
- UZUC is the agreed supplier for ABB, Du Pont, Sulzer, Bechtel, Hunday, Tractebel, Samsung, Zimmerman etc.;
- TITAN ECHIPAMENTE NUCLEARE (TEN) owns a technology transfer from General Electric for loading and unloading machine terminals;
- WALTER TOSTO-FECNE is the certified supplier for Exxon Mobil, Linde, Agip KCO, Petrobras, KNPC, Bechtel etc.

The manufacturing premises of these companies have been limited to the areas required by the manufacture lines for existing orders. The refurbishment and the upgrade of existing equipment is a constant pursuit of all companies. The most interesting results in this field have been seen at AUTOMATICA, POPECI UTILAJ GREU and WALTER TOSTO-FECNE.

C. With regard to the companies specialized in **construction-installation activities**, it is safe to say that most of them are almost constant presence in CNE Cernavodă operations, either by participation in the investment programmes for Units 1 and 2 (ELCOMEX, GENERAL CONCRETE, NIMB-CONSMETAL, STIZO, UNIFY), or by the execution of scheduled

and preventive maintenance works (scheduled shut-downs) on these nuclear power units. It must be specified that these companies' taking over some operations outsourced by CNE Cernavodă (ELCOMEX, UNIFY, GENERAL CONCRETE) has concurred to maintaining their capabilities but not to the same extent as the execution of major investment projects like the execution of Units 1 and 2. Some companies included in the construction-installation category have dealt with financial difficulties, some being closed and others going through hard insolvency times. Revitalizing measures on construction-installation works are required for the volume of operations related to Units 3 and 4, especially on the mechanics, electric and automation components, focusing on drawing-in specialized professions (for instance, welders).

With regard to the commissioning operation, **SNN** has CNCAN approvals for the operation and maintenance of Units 1 and 2 of CNE Cernavodă, possessing the experience required to commission CANDU type units, such experience being acquired during the commissioning of the units it currently operates.

2.4 **Other aspects** established based on ROMATOM analysis:

i. **The quality management system**: most companies under review have kept their good practices in carrying out their business, complying with the requirements of quality management systems, this enabling them to perform activities specific for Units 1 and 2 Cernavodă. Thus, over 95% of the companies which replied to the questionnaire (see Annex 3) have kept their CNCAN quality management certificates. Some of them, although had no orders or had a limited number of orders for the Romanian nuclear field, obtained the re-certifications from CNCAN (COMPCONTROL, ELCOMEX, GENERAL CONCRETE, GENERAL TURBO, IMSAT, IFIN-HH, IPROCHIM, POPECI UTILAJ GREU, RATEN-CITON, UTI, WALTER-TOSTO and others). Other companies (like ENERGOBIT, DOOSAN-IMGB, GRIRO, PRYSMIAN GROUP) have indicated in the questionnaire that they are willing anytime to apply for CNCAN certificate, provided that there is a certain promise of orders from the nuclear field. It must be said that these companies already have in place quality management systems certified by other certification bodies (ISO, ASME, LOYD, BUREAU VERITAS etc.). Under these circumstances it is assumed that in case of the issuing orders, these companies could be able to satisfy the requirements of Romanian nuclear field, in technical terms, as well as quality terms specific to the nuclear industry.

   The quality management system applied by all companies which replied to the questionnaire is an integrated system that answers the quality, environmental, health and security requirements, at the same time. This is also an important aspect given the particular requirements of manufacturing for nuclear objectives.

ii. **Experience in the nuclear field**: over 98% of the companies which replied to the questionnaire have taken part in nuclear projects; some of them - for instance AUTOMATICA, ELCOMEX, FEPA, NIMB, RATEN-CITON, STIZO, TEN, UZUC - had a major contribution to the construction of Units 1and 2 Cernavodă.

Although there were no orders from the Romanian nuclear field, companies like DOOSAN IMGB, WALTER TOSTO-FECNE, IMSAT, POPECI UTILAJ GREU, KINECTRICS, TRACTEBEL have contracts concluded with nuclear field beneficiaries from other countries, either via their own production facilities in Romania or via their parent companies.

iii. **The staff**: the training level of the staff within over 95% companies is very good, the employees being skilled and certified to perform activities specific to the businesses of their companies. For instance, AUTOMATICA, WALTER TOSTO-FECNE and POPECI UTILAJ GREU have opened welding schools and/or staff training centers which satisfy their own requirements.

According to the data sent by respondents, the number of jobs from Romanian nuclear supply chain is estimated currently at over 11.000. With regard to the possibility of creating new jobs by accepting prospective orders related to the Project completion, based on the replies given by the companies which provided these data, it was determined that another 8.000 new jobs can be created, especially in relation to the construction-installation activities. To conclude, we may estimate that for the completion of Units 3 and 4 about 19.000 jobs are required in the national supply chain.

iv. **The turnover**: the 42 companies which replied to ROMATOM questionnaire and are interested in participating in the Units 3 and 4project, had in year 2017 an aggregated turnover of about 2.730 million Lei (equivalent to about 590 million Euro), higher by about 14% as opposed to 2.405 million Lei (equivalent to about 550 million Euro) in year 2012 reported by the 47 companies which replied to the questionnaire at that time. Out of these:

- The companies specialized in project management, engineering, design, research and consultancy have reported a total turnover of about 724 million Lei in year 2017 (an increase from 265 million per year 2012).
- The companies specialized in the manufacturing of components and equipment and other activities have reported a total turnover of about 1.475 million Lei in year 2017 (similar to the turnover of 1.500 million Lei in year 2012).
- The companies specialized in construction-installation have reported a total turnover of about 531 million Lei in year 2017 (a decrease from 640 million per year 2012).

2.5 The potential of Romanian nuclear supply chain involvement in the Project completion

The review of replies to the questionnaire revealed that **there is an obvious interest of the responding companies** to submit tenders for services/equipment and materials/works related to the Project completion, based on their business specificity. Thus, ROMATOM is estimating that the involvement of Romanian nuclear industry in the Project completion may materialize mainly, in all identified areas:

A. project management services, engineering services, design, research and consultancy services;

B. manufacturing of equipment and components, including the nuclear fuel, as well as other activities;

C. construction-installation, commissioning activities and other adjacent activities,

as follows:

A. Ensuring project management services, engineering, design, research and consultancy services

According to the replies of the questionnaire and information gathered from available various sources can be said that:

- For drawing-up the execution details, engineering support reviews, supporting documents for license (nuclear security, environmental protection, provision of utilities), the documents required to obtain agreements and approvals, as well as for ensuring the engineering technical support on-site and procurement support, etc., a series of Romanian engineering service companies are qualified, like CITON/RATEN, KINECTRICS, MATE-FIN, TRACTEBEL. Some of these companies are currently working on similar major projects related to the construction of new nuclear units or the refurbishment existing in countries from Europe and in Canada.
- Complex consultancy services for the beneficiary *(owner engineer* type services) or contractors (documentation required to obtain approvals and licenses, including the nuclear approvals) participating in project implementation can be ensured especially by the branches of international companies with reliable engineering offices in Romania, for instance KINECTRICS and TRACTEBEL. These companies have the capabilities and flexibility to provide such services, acting on their own or by thejoint ventures establishing with other well knowened international firms.
- The research companies which replied to ROMATOM questionnaire - ICSI Rm. Vâlcea, IFIN-HH and RATEH-ICN - have shown a strong interest in offering their services for the Project completion, based on their capabilities and prior experience acquired in the field of nuclear power and nuclear physics.

B. Manufacturing the mechanical equipment and parts, including nuclear fuel production

The following prospective contributions to the completion of Units 3 and 4 may be listed for the nuclear and well as for the conventional component of the two nuclear reactors:

- AUTOMATICA, ELECTROALFA Botoşani and ELCOMEX IEA are able to manufacture desks and workstations for the control room, automation cabinets, Power Center and MCC supply desks, local racks for equipment, etc.;
- COMES, FEPA and VALVE are able to manufacture nuclear and non-nuclear valves, reinforcements and filters;
- DOOSAN – IMGB is able to supply large casting and forged parts required to build certain nuclear equipment by the suppliers of such equipment. ELECTROALFA is able to manufacture electric transformers and power hardware;

- FCN Pitești/SNN is able to supply nuclear for the first loads, provided that the current production capacity is increased;
- FEPA is able to manufacture components for electric power cable laying and protection systems and components for measuring and automation systems, like diaphragm positions, electromagnetic round valves, direct pressure regulators, thermal fuses, thermocouple, gauges, instrumental air filters;
- GENERAL TURBO is able to manufacture components for high power turbo-generators (700 MW), possibly contributing based on partnership to the overall supplies of turbo-generator manufacture and installation;
- GENERAL TURBO and WALTER TOSTO – FECNE are able to manufacture the feeder - collector assemblies and lower feeder assemblies, system of pipeline stands for the nuclear and conventional component of the plant, fittings for tubing systems and carbon-steel and alloy steel fittings for pipeline systems;
- GRIRO and UZUC are able to manufacture tanks and heat exchangers for thermal-mechanical systems of the nuclear and conventional component of this project, including degassers, hot wells, capacitor bodies;
- GRIRO, POPECI UTILAJ GREU, WALTER TOSTO-FECNE, based on collaboration with foreign companies, are able to manufacture equipment with large overall dimensions like steam generators;
- POPECI UTILAJ GREU, UZUC, WALTER TOSTO - FECNE are able to manufacture small and big heat exchangers, except steam generators;
- POPECI UTILAJ GREU and TEN are able to manufacture bridges for the transport and positioning of fuel loading-unloading equipment maintenance platform;
- PROMPT – UMT is able to manufacture lifting equipment, including 200/36 tone travelling cranes required for metallic structures and installation of hydro-mechanical equipment installation.
- PRYSMIAN GROUP is able to manufacture electric power cables for the nuclear and conventional components of the project;
- TEN is able to manufacture auxiliary equipment and systems for fuel loading-unloading machinery, fresh, failedand spent fuel, transport and handling equipment, installation and maintenance equipment for reactivity control mechanisms and for fuel channel cut-offs, compressed-air control systems for airlockd and doors;
- WALTER TOSTO – FECNE is able to manufacture and supply the Calandria vassel enclosures and metallic structures such as the airlocks, shield doors and cut-off doors for the nuclear component of the project;

C. Construction-installation, commissioning activities and other adjacent activities

We may assert that these activities required for the completion of Units 3 and 4 of CNE Cernavodă can be mainly carried out by Romanian companies, based on identifying and implementing certain supporting measures for the local relevant industry field. The following prospective contributions can be listed:

- Civil works, metallic structures, hydrotechnical structures, mechanic, electric, AMC and telecommunication device installation works, installation of HVAC systems, sanitation facilities, waste water and rain water draining systems for the nuclear and conventional components of the nuclear power plant.

  Certain works requiring specified experience, high skills or advanced technologies unavailable locally will have to be carried out in collaboration with international partners (for instance, installation of fuel channels or installation of heavy and oversized equipment via open-top procedure (on the upper side of the covering, using heavy cranes) on Unit 3, when the ring beam requires the reactor building dome to be dismantled).

- SNN is able to ensure recruitment and training services related to the personnel required for the commissioning and operation of Units 3 and 4, as well as the actual; commissioning works and operational tests, based on the experience acquired in Units 1 and 2 of Cernavodă.

We must emphasize that during the construction-installation works, the management of material assurance system must be applied by acquiring and manufacturing the materials needed for construction and installation works, and Romanian companies - like ELCOMEX IEA GENERAL CONCRETE, NIMB, STIZO, TMUCB, UNIFY etc. - are familiar with this system.

ROMATOM deems as a vital aspect for the development of completion project related to Units 3 and 4 of CNE Cernavodă the fact that construction and installation companies which replied to the questionnaire are applying a management system in-line with the nuclear field requirements, are using the relevant experience of their staff and are carrying out activities specific to nuclear objectives, based on special requirements related to the occupational health and safety established by the national legislation, as well as by various codes and standards applicable.

ROMATOM is convinced that other companies, which have not replied to the questionnaire or have been left out because the association had no data on them, will be interested to participate in the completion of this project, based on their proven competences.

With regard to the **economic and financial potential of companies identified by ROMATOM**, shown by the annual turnover data, the review of the questionnaires has revealed that the total annual turnover per year 2017 is of about 2.73 billion Lei (about 590 million Euro), with the following breakdown:

A. The companies specialized in project management, engineering, design, research and consultancy have reported a total turnover of about 724 million Lei in year 2017 (an increase from 265 million per year 2012).

B. The companies specialized in the manufactur of components equipment and other activities have reported a total turnover of about 1.475 million Lei in year 2017 (similar to the turnover of 1.500 million Lei in year 2012).

C. The companies specialized in construction-installation have reported a total turnover of about 531 million Lei in year 2017 (a decrease from 640 million per year 2012).

Thus, **it is estimated that the potential participation of Romanian nuclear industry in the completion of Project Units 3 and 4 Cernavodă, with the products and services specified within this Study, can be assessed at about 1.0. up to 1.6 billion Euro, which would be somewhere between 25 and 40% of the total value of the EPCC Contract, thus representing a major contribution with a significant impact on the national economy and its re- industrialization.** The relatively high gap between 25% and 40% is given by the lack of a certain value of EPCC Contract available at this time, as well as the fact that some of the responding companies are operating in similar business areas (engineering, electric and automation outfitting, pressure vessels, etc.), in some cases competing for the same amount of furniture, works or services. Based on the same reasons, ROMATOM feels that the actual participation of Romanian relevant field is somewhere between 25 – 40%, but under no circumstance less than 25%.

According to the data sent by ROMATOM questionnaire respondents, the current number of jobs in the Romanian supply chain, which can be assigned to the Project, is of about 11.000, with the option to add another 8.000 new jobs which may be established in case of receiving orders/contracts for the Project completion. To conclude, the Romanian industry is able to ensure a **maximum number of about 19.000 jobs dedicated to Project completion**, taking into account only the industry directly involved in execution, without two or three suppliers. This assessment represents the maximum achievable during the peak interval of this project and not an average for its entire execution, starting with the design, manufacture and ending with the construction-installation and commissioning phases. Via an optimum management of resources, taking into account the maximum values of labor force demand, the project execution, Unit 1 lifetime cycleextention, operation and maintenance support for existing nuclear units are activities that can be handled at the same time.

Also, the impact on "dependents" of ROMATOM review turnover was not evaluated. In the same time, the Study did not assess the impact of state budget caused by taxes and duties on revenues obtained by persons employed on the above identified jobs.

As comparison, during Unit 2 completion peak interval, January – April 2007, in terms of Romanian personnel, there were about. 1500 – 1750 employees within AECL-ANSALDO-SNN joint team of project leadership, SNN staff or subcontracted personnel and about 600 execution employees involved in the commissioning and provided by SNN. As Romanian subcontractors, there were somewhere between 1750 - 2100 employees on site, including the supporting personnel as well. With regard to the manufacture of components and equipment, a number of about 250 – 300 employees was estimated for interval relatively shorter than the project completion work interval, taking into account the fact that most of this field was involved in production activities prior to 1990. This comparison is only indicative, Unit 2 project being a project of completion of the investment already started prior to 1990 and a contract format different than the one considered for the completion of Units 3 and 4.

Chapter 3
FINAL FINDINGS. CONCLUSIONS

This Study performed by ROMATOM in year 2013 and the update carried out this year have highlighted the fact that a significant number of economic agents for the machinery manufacturing and electrotechnical sectors, construction - installation services, engineering and research are willing and able to participate currently in the completion of Units 3 and 4 of Cernavodă.

There is an obvious interest of Romanian companies, identified by ROMATOM in this Study, towards a prospective participation with equipment, materials and services intended for Project completion, depending on the particularity of their business lines. Responding companies feel that participating in this project will provide them with the singular opportunity for increasing their technical capabilities given the application of particular requirements established by the nuclear power field (integrated management, quality assurance, etc.).

In order to satisfy the more and more strict technical and engineering requirements, specific to the current industrial progress, a series of Romanian economic operators from the nuclear field are pursuing the refurbishment and upgrading of existing equipment and procurement of new efficient equipment, an approach which can also be beneficial for the Project execution.

Romanian industry participation in Units 3 and 4 Cernavodă completion would have an extremely favorable impact on the national economy, being well known that investments lead to GDP increase, creation of new jobs, additional revenues for state budget, all these in turn generating a multiplying effect in the economy with significant repercussions on national economy reindustrialization.

As a first conclusion of this Study, **it is estimated that the potential participation of Romanian nuclear industry in the completion of Project Units 3 and 4 Cernavodă, with the products and services specified in the said Study, can be assessed at about 1.0 up to 1.6 billion Euro, which would be somewhere between 25% and 40% of the total value of the EPCC Contract, thus representing a major contribution with a significant impact on the national economy and its industrialization.** The relatively high gap between 25% and 40% is given by the lack of a certain value of EPCC Contract available at this time, as well as by the fact that some of the responding companies are operating in similar business areas (engineering, electric and automation outfitting, pressure vessels, etc.), in some cases competing for the same volume of supplies, works or services. Based on the same reasons, ROMATOM feels that the actual participation of Romanian relevant sector is somewhere between 25% – 40%, but under no circumstance less than 25%.

According to the data sent by ROMATOM questionnaire respondents, a second conclusion is that the current number of jobs in the Romanian supply chain, which can be assigned to the Project, is of about 11.000, with the option to add another 8.000 new jobs which may be established in case of receiving orders/contracts for the Project completion. To conclude, the Romanian industry is able to ensure a **maximum number of about 19.000 jobs dedicated to**

Project completion, taking into account only the industry directly involved in execution, without two or three suppliers.

This assessment represents the maximum achievable during the peak interval of this project and not an average for its entire execution, starting with the design, manufacture and ending with the construction-installation and commissioning phase. Via an optimum management of resources, taking into account the maximum values of labor force demand, the project execution, linking with the expansion of Unit 1 life cycle and operation and maintenance support for existing nuclear units are activities that can be handled at the same time.

As final conclusion it is deemed that the participation of Romanian nuclear industry in the Project completion will mean, mainly, putting forward the investments made in the past, based on imported *know-how*, as well as the facilities and production areas intended for the manufacture of parts and equipment for nuclear power units of CANDU 6 type, without taking into account the recovery of investment made in the production of heavy water and structures existing on the Project location, which are estimated at about 1 billion Euro.

This Study aim was not to analyze and develop energy security aspects, aspects related to the national economy decarbonatation or consumer access to electric power which, together with other aspects, are well documented and presented in the draft of the **Romanian Energy Strategy 2018 – 2030, with an outlook on year 2050**.

The execution of the Project has every chance to revitalize the direct investments in Romanian companies which are interested in the Project completionparticipation, in order to update and /or renew the production equipment, including by employing and training new experts in the field of nuclear energy and equipment manufacture. Thus, we see the possibility to reconnect a major part of national industry up to the top level of equipment manufacturing and service supply for nuclear power plants, which will lead to an increase and strengthening of technical level, that is part of a national reindustrialization policy, as well as to an increase of competitiveness on external markets.

ANNEXES

ANNEX NO. 1 LIST OF COMPANIES INVITED TO PARTICIPATE IN THE ASSESSMENT, RESPECTIVELY THOSE WHO REPLIED TO ROMATOM QUESTIONNAIRE

ANNEX NO. 2 TEMPLATE OF ROMATOM QUESTIONNAIRE SENT TO PROSPECTIVE PARTICIPANTS SELECTED FOR PROJECT U3 AND 4 CERNAVODĂ

ANNEX NO. 3 DETAILS RELATED TO PROSPECTIVE PARTICIPANTS IN PROJECT U3 AND 4 CERNAVODĂ

ANNEX 1

LIST OF COMPANIES INVITED TO PARTICIPATE IN THE ASSESSMENT, RESPECTIVELY THOSE WHO REPLIED TO ROMATOM QUESTIONNAIRE

Item No.	COMPANIES TO WHICH THE QUESTIONNAIRE WAS SENT	COMPANIES WHICH REPLIED TO THE QUESTIONNAIRE
(1)	(2)	(3)
A. COMPANIES SPECIALIZED IN PROVIDING ENGINEERING SERVICES, DESIGN, RESEARCH AND CONSULTANCY SERVICES		
1.	ASTRAL	X
2.	CELIN	X
3.	ENERGOTECH	X
4.	EUROTEST	-
5.	ICCO	-
6.	I.C.S.I. RÂMNICU VÂLCEA	X
7.	I.C.P.E.	-
8.	HORIA HULUBEI IFIN HH	X
9.	INCA BUCUREȘTI	-
10.	S.C. IPROCHIM S.A	X
11.	ISPE S.A	-
12.	KINECTRICS SRL ROMÂNIA (former AMEC)	X
13.	RATEN (by CITON BUCHAREST and ICN PITEȘTI branches)	X
14.	SIVECO	-
15.	SOLANCE MINING SRL (former GVC COMPLETE PROIECT)	X
16.	ROMELECTRO	X
17.	TRACTEBEL ENGINEERING SA	X
18.	TRAFO CONSTRUCT	-
B. COMPANIES SPECIALIZED IN MANUFACTURING OF PARTS/EQUIPMENT AND OTHER ACTIVITIES		
1.	ABB	-
2.	AGER	-
3.	ANSALDO	-
4.	AUTOMATICA	X
5.	AVERSA	-
6.	BENEVO	-
7.	BUREAU VERITAS	-
8.	CEMS	-
9.	CNU	X
10.	COMES S.A.	X
11.	DOOSAN IMGB	X
12.	ELECTRO CONTACT	-
13.	ELECTRO ALFA	X
14.	ELECTROPUTERE	-
15.	ENERGOBIT	X
16.	ENERGONUCLEAR	-
17.	FEPA BÂRLAD	X

18.	GRIRO	X
19.	GENERAL TURBO	X
20.	GENERAL ELECTRIC	X
21.	MATE FIN	X
22.	MARSH	-
23.	MECROSYSTEM	X
24.	NOVUSCO	-
25.	POPECI UTILAJ GREU	X
26.	PROMT – UMT	-
27.	PRYSMIAN – GROUP	X
28.	RETROM PAȘCANI	-
29.	ROSEAL	X
30.	S.N.C. LAVALIN	-
31.	SUN FLOWER	-
32.	SNN/FCN Pitesti Branch	X
33.	TEN BUCUREȘTI	X
34.	UTI – BUCUREȘTI	X
35.	UZUC PLOIEȘTI	X
36.	VALVE BACĂU	X
37.	WALTER – TOSTO (former FE-CNE)	X
C. COMPANIES SPECIALIZED IN CONSTRUCTION-INSTALLATION, COMMISSIONING ACTIVITIES AND/OR OTHER ADJACENT ACTIVITIES		
1.	AEDIFICIA CARPAȚI	-
2.	COMPCONTROL	X
3.	ELCOMEX	X
4.	ENERGOMONTAJ IEA	-
5.	ELECTROMONTAJ CLUJ	X
6.	GENERAL CONCRETE	X
7.	IMSAT S.A.	X
8.	S.C. MAIRA MONTAJ	X
9.	NIMB CONSMETAL	X
10.	SNN/CNE Cernavoda branch	X
11.	STIZO NUCLEAR	X
12.	UNIFY S.A.	X

ANNEX 2

QUESTIONNAIRE

(*for identifying the Romanian industry level of capacity to sustain*

the execution of U3 and U4 of Cernavodă)

1. Name and contact details of responding company:

2. Is your company interested in submitting a tender for equipment/materials/services for the Project of Nuclear Units 3 and 4 of Cernavoda and, if so, for what (please specify the business area or a detailed list of products/services you can offer).

   a) □ **YES**
   b) □ **NO**

3. Your company has/will have orders for the nuclear sector in Romania/worldwide?

   a) □ **YES**
   b) □ **NO**

4. What is your experience in the area you wish to submit a tender; if you have licenses, know-how and what kind?

Experience	**Licenses/Know-how**	**Area**
a) □ **≥5 YEARS**	**a)** □ **ONE**	
b) □ **<5 YEARS**	**b)** □ **SEVERAL**	
c) □ **NONE**	**c)** □ **NONE**	

5. The activities of your company are carried out based on a Management System certified/authorized, including by CNCAN?

   a) □ **YES**
   b) □ **NO**

   If **YES,** what standards are you applying for this system?

   a) □ **ISO 9001**
   b) □ **ISO 14001**
   c) □ **OHSAS 18001**
   d) □ **NMC (□ -01; □ -02; 04; □ -05; □ -06; □ -07 ; □ -08; □ -12)**

e) □ **ISO 17025;**
f) □ **Other international standards (please list them)**

6. Has your company previously participated in other nuclear projects from Romania or abroad, supplying products, services or construction-installation activities?

a) □ **YES** (detail what you have supplied)
b) □ **NO**

7. Provide a quantity and quality characterization of the manpower you envision for ensuring the supplies tendered. To what extent this manpower has experience and qualification in the nuclear area?

a) Is there certified/skilled personnel: □ **YES** or □ **NO**

If your answer is YES, please specify:

- Number of authorized personnel:
- Number of skilled personnel
- Activities for which the personnel is authorized:

8. Do you have available resources to ensure the expansion of your activity in order to provide products/services for U3/U4 of Cernavoda, training/competence classes for supplementing the skilled human resources?

a) □ **YES**
b) □ **NO**

9. Are your sub-suppliers able to sustain the expansion of your activities for the supply of products and services intended to complete U3 and U4 of Cernavodă? Are you using a qualification process for these suppliers?

a) □ **YES**
b) □ **NO**

10. Does your company include own staff training activities?

a) □ **YES**
b) □ **NO**

11. What are the economic and financial coordinates of your company in terms of:

- Turnover:
- Number of employees:

NOTE:

- Companies with foreign capital will fill-in only the information related to their operations performed in Romania but are encouraged to send to Nuclearelectrica, to inform ROMATOM, data on the capabilities of the group they are part of
- It is preferable to send only public information but in case of relevant information which you do not deem as public, please specify their "**confidential nature**" and ROMATOM will ensure the confidentiality of data you sent.
- Any details concerning the information requested are welcomed

Your replies will be sent to ROMATOM e-mail addresses: romatom.secretary@gmail.comand adrian.panait1@yahoo.ro

(Name, position and signature of the responding company's

legal representative)

Date:

ANNEX 3

PROSPECTIVE PARTICIPANTS IN PROJECT U3 AND U4 CERNAVODĂ

- synthesis -

Item no.	Company name	Business area	Member of ROMATOM	Supplier of SNN/CNE	Name of supply for U1/ U2 Possible participation to U3/U4	Authorization no./ CNCAN Approval validity
COMPANIES SPECIALIZED IN MANUFACTURING EQUIPMENT AND PARTS, INCLUDING PRODUCTION OF NUCLEAR FUEL, AS WELL AS OTHER RELATED ACTIVITIES						
1.	**AUTOMATICA S.A**	**Manufacturing and supply of class 3 services** for - low and medium voltage electric power distribution equipment - complex automation equipment and systems for industrial flows - industrial electronic equipment, - weighing and batching equipment - metallic structures - protection powder- coatings.	YES	YES	Manufacture and fitting of boards from the control rooms; local supply and control boards; actuating and automation systems for access hatches; control unit of ventilation system installed in the machine room.	N/A*
2.	**SC.COMES SA**	**Manufacture** of pressure vessels, tanks, distilling tubes.	YES	YES	Distilling tubes	L103-LEDN72017 AI1040/2015 17-021/2017 ISCIR,TUV
3.	**BIS NIMB S.A**	**Manufacture** metallic structures and components of metallic structures, installation of assemblies and equipment.	YES	YES	Metallic structures and components of metallic structures, installation of assemblies and equipment.	N/A*
4.	**DOOSAN- IMGB**	**Manufacture of heavy casting and forging pieces**, casting and forging components for energy generation, nuclear industry, cement industry, mining industry, building of ships and general machinery construction areas.	YES	NO	N/A	N/A but is willing to obtain certification if there are orders from the nuclear sector.
5.	**ELECTROALFA Internaţional**	**Class 3 manufacture**, for low and medium voltage boards and equipment, transformer stations, low and medium voltage cells, control, command, automation and distribution systems for direct and alternative current, provision of services dedicated to nuclear plants.	YES	NO	Low and medium electric boards	**N/A**
6.	**ENERGOBIT**	design, manufacture and installation of 0,4-400kv electric systems	NO	NO	Has not supplied for U1 and U2	N/A, ISO9001, ISO14001, ISO17025, OHSAS 18001

7.	**FEPA Bârlad**	Manufacture of valves, pressure, temperature and level transducers, converters, pressure regulators, automation system accessories for class 3 nuclear segment Design, manufacture and sale of electronic and compressed-air tools for processor control.	NO	YES	Manufacture of valves, pressure, temperature and level transducers, pressure regulators, electric, compressed-air and mechanical shutters.	N/A but did not have certification until 2017
8.	**GRIRO S.A**	**Class 1 manufactur**e of pipes and piping elements, pressure equipment, various metallic structures, services related to the manufacture and installation of products dedicated to nuclear systems. **Design** of own manufactured products, like pipes and piping elements, pressure equipment (containers, heat exchangers, columns, vessels, tanks, filters, agitation vats), metallic structures diverse.	NO	NO	Flow measurement systems	N/A*
9.	**GENERAL TURBO**	**Construction-installation:** mechanical installation and maintenance of nuclear equipment and systems, installation of electric cable pathways, insulation works, mechanical installation and maintenance of rotary equipment – turbine, generator, machine room, upgrades, tests and trials. **Manufacture** of turbo-generators of maximum 700 Mw on saturated steam, electric engines; blower pumps. Design of energy equipment	YES	YES	Components of 700 MW turbo-generators on saturated steam included in the General Electric scope of supply; cooling water pumps for condenser (at IMGB)	**N/A**
10.	**GENERAL ELECTRIC**	High power electric machinery Electric engines and generator sets Electric transformer stations Various components for wind power systems	YES	YES	Fixed coil bars Connecting belts Fixed coil reels for power generator sets	**No CNCAN license ISO 9001, ISO 14001, ISO 17025, OHSAS 18001**
11.	**MATE FIN SRL**	**Class 3 manufacture and services,** equipment and subassemblies for radioactivity monitoring, interfaces for adaptation and upgrade of radioactivity monitoring equipment, services for management of medium and low radioactive waste, pretreatment and treatment of liquid and solid radioactive waste, curing and characterizing low and medium radioactive waste. **Construction-installation,** assembly of radiation monitoring equipment, assembly, connecting and commissioning of nuclear radiation monitoring equipment at air, water, electric power utilities, civil and industrial buildings, hydro-insulations. Thermo-insulations, plumbing, plaster works, painting, plating of walls, floors, low voltage and minute current systems, heating systems, ventilation, air-conditioning, cooling systems, automation systems, telecommunication and IT systems.	YES	YES	Supply activities, manufacturing and services for radioactivity monitoring equipment and subassemblies.	**N/A***
12.	**MECROSYSTEM.**	Lab systems and devices, spectrometers	NO	NO	Various lab facilities, spectrometers	N/A
13.	**POPECI UTILAJ GREU**	**Manufacture:**Turning and boring lathes, hydraulic presses,metallurgic equipmentenergy equipment(exhaust casing ,gasturbine casing,sand hogs,mining equipment,mechanical subassemblies).	NO	YES	Carriages and bridges for moving nuclear fuel loading-unloading machineries, maintenance platform for loading-	N/A but is willing to obtain certification if there are orders from

		Welded structures **Services**: - Repair of machinery-tools and accessories; - Static and dynamic balancing; - Heat treatment or vibration-treatment stress relief; -3D modelling, individual assembly or repair; - Execution of full projects (conceptual design and details); - FEA Analysis (finished element analysis) – optimization of benchmarks and subassemblies.			unloading machineries.	the nuclear sector.
14.	**PRYSMIAN GROUP**	**Power and control electric cables of various types for use outside the radioactive area** **Power and automation electric cables of various types for use outside the radioactive area of power plants**	YES	NO	NO	**No CNCAN license** **ISO 9001** **ISO 14001** **ISO 17025** **OHSAS 18001**
15.	**ROSEAL S.A**	**Class 1 services and manufacture,** mechanical packing and spare parts for mechanical packing field, manufacture of pipeline components by mechanical processing. **Design**, mechanical packing, spare parts for mechanical packing, pipeline elements.	YES	YES	Mechanical packing, spare parts for mechanical packing, repairs of condensate pump packing.	**N/A**
16.	**SNN/FCN Piteşti**	Production of nuclear fuel of CANDU type	NO	YES	Delivery of CANDU nuclear fuel for both units. Beryllium sedimentation systems	12-043/ 17.09.2016 CAN3-Z299.2-85
17.	**TEN Bucureşti**	**Supply**, for nuclear systems, equipment for fuel handling system, containers, elements of primary circuit, racks, anti-seismic dampers, **Class 1 manufacture** and services for heating treatments, galvanic covers, physical and chemical tests, mechanic trials, non-destructive control intended for nuclear systems.	YES	YES	Equipment included in the handling system for fresh and burned nuclear fuel; storing equipment, storage and control of used fuel; equipment, instrument panels and systems; maintenance tools and devices; pipe brackets and anti-seismic dampers; shielding and transport containers, technical support services for installation and operational tests.	17-006/2017 16-067/2016 VP-02/2015 VP-01/2016 VP-02/2016 CA-05/2015
18.	**UZUC S.A**	**Manufacture and service**s for mechanical equipment, pressure containers, heat exchangers, tanks, mixers, filters, ion exchanging tubes, agitation vats, metallic compensators, metallic structures, bearings, pipes and pipeline elements, gauges for the nuclear and conventional components of the power plants.	NO	YES	Manufacture of pressure containers, heat exchangers, tanks, filters, ion exchanging tubes for the nuclear and conventional components of the power plant; heavy water vapor recovery facilities.	N/A
19.	**UTI SISTEMS**	**Design, manufacture and installation** for: -complex security systems, anti-theft alarm, fire detection and extinguishing systems, CCTV, - low and medium voltage systems -heating systems, -ventilation systems, industrial robots	YES	YES	Design and technical support for access control systems DICA physical protection systems Anti-theft and fire protection systems.	N/A* ISO 9001, ISO 14001, ISO17025, OHSAS18001 ISO20000-1MRS 10000 ISO/CEI 27001

20.	**VALVE BACĂU**	**Design and manufacture of industrial valves.** **Distribution of fittings, pipes, pumps, meters, safety valves**	YES	YES	Industrial valves	No CNCAN license ISO9001, ISO14001, ISO 17025, OHSAS18001
21.	**WALTER – TOSTO (former FE-CNE)**	**Manufacture** of components and items for nuclear systems, like steam generator sets and components for heat transfer occurring in the primary circuit. In case of secondary circuits, manufacture of HP/LP pre-heaters for supply water, heat exchangers, HP condensers, degassers and supply water tanks, equipment hatches and personnel hatches, etc.	NO	YES	FECNE has delivered vessels and tanks with thick walls and big overall sizes for the primary cooling circuit of nuclear reactor (pressurized device, degasser-condenser, heavy water tank), metallic structures of access hatches for materials and persons, tanks for the cooling system in case of damage, degassers and supply water tanks, high and low pressure preheaters.	N/A but is willing to obtain certification if there are orders from the nuclear sector.
COMPANIES SPECIALIZED IN CONSTRUCTION-INSTALLATION, COMMISSIONING ACTIVITIES AND/OR OTHER ADJACENT ACTIVITIES						
22.	**COMPCONTROL**	**Class 3 services** for: - inspections by non-destructive control, - integrity analysis for metallic structures, - operations with plugs and bushings for steam generator sets and heat exchangers.	YES	YES	Execution of operations in the controlled area and non-destructive inspections in the controlled area and outside this area.	**N/A***
23.	**ELECTRO MONTAJ Cluj**	Design, manufacture and installation of 0,4-400KV electric systems	NO	NO	Was not involved in the execution of U1 and U2	N/A
24.	**ELCOMEX**	**Supply**: with low, medium and high voltage materials, protection and automation equipment, pressure systems, hoisting systems, ventilation, air-conditioning and sanitary systems. **Construction-installation** of low, medium and high voltage equipment, lighting systems, earthing systems, atmospheric stress protection systems, voice and data networks, hoisting systems, pipelines, equipment and metallic structures, prefabs and racks. **Class 3 manufacture and services** for metallic elements dedicated to electric installation, feeder boxes, electric board cabinets, pipe racks, repair of electric equipment, instruments and pressure systems, pressure pumps, preservation of electric equipment and machinery. **Design:** systems, facilities, equipment and services for the electric component of nuclear premises of maximum 400 KV voltage, 0.4-400KV electric power grids, systems and services for technological and mechanical equipment of buildings, outdoor utility networks, automation of processes, certified repairs on	YES	YES	Basic collaborator of CNE, a significant percent of the company's business activities are performed at CNE based on outsourcing contract related to CNE operations.	N/A*

		hoisting systems. **Use of software products:** design and analysis of structures and elements with security roles, data transfer between PC programs.				
25.	**ELECTROMONTAJ CARPATI SIBIU**	Installation of 0,4-400KV electric systems	NO	NO	NO	No CNCAN license
26.	**GENERAL CONCRETE SRL**	**Construction - installation:** buildings or areas of buildings, roads, hydrotechnical structures, repair and preservation of structures, installation works, drilling and injection works, hydro-insulation works. **Class 4 manufacture and services** manufacture of metallic structures, including metallic surfaces, repair and maintenance services for metallic structures, decontamination, handling and storage of products, transport of products inside CNE Cernavodă facilities. **Supply**: of construction materials intended for systems.	YES	YES	Decontamination services inside nuclear buildings, preservation of products, construction activities.	**16-051/2016** **16-058/2016** **17-020/2017** **02/2017** **CA 13/2017**
27.	**IMSAT S.A**	**Construction - installation** of mechanical machinery, electric systems and automation, maintenance and control systems. **Class 3 manufacture and services**, metallic structures, LOCAB elements, racks, mounts, lighting and grounding systems, electric power distribution equipment.	YES	NO	Installation works on electric power and automation systems for the nuclear component of the power plant.	17-025/2017
28.	**NIMB CONSMETAL SRL**	**Construction - installation**, metallic structures, beams, vertical and horizontal bracing, roof templets, platforms, mounts for equipment, ramps, railings, beams and race ways for running bridges, prefab systems of mounts and gas pipelines, plumbing, heating, fire extinguishing, ventilation and air-conditioning systems, installation and repairs of hoisting systems. **Class 2 manufacture and services** for pipelines, pipe elements, metallic structures and prefabs for ventilation, air-conditioning, heating, sanitary, gas, fire extinguishing systems, maintenance and overhaul of machinery and engineering systems. **Supply** of metal sheets, sections, pipes, benchmarks for facilities. **Design** of nuclear and non-nuclear civil/industrial buildings.	NO	YES	Construction and installation of metallic structures and ventilation, air-conditioning, sanitary, gas, fire extinguishing systems for the nuclear and conventional components of the power plant.	**N/A***
29.	**SC MAYRA MONTAJ srl**	**Design, manufacture and installation of electric equipment**, repairs of power transformer stations of maximum 400KV	NO	YES	Repair services for 250MVA,400/110KV interconnection transformer stations	N/A
30.	**STIZO NUCLEAR S.A**	**Construction- installation** of concrete, reinforced concrete or plaster structural elements and structures, reinforcement works, repairs, epoxy and elastic lining, special decontaminable sealing works.	NO	YES	Epoxy protection works, elastic lining, decontaminable sealing works.	**CM**=11-033/ 22.01.2013
31.	**UNIFY CO LTD SRL**	Construction - installation of epoxy and polyurethane floors, resin injections in the concrete structures, passive fireproof protections, painting works on metallic, wood and plastic structures, indoor and outdoor finishing works.	YES	YES	Carries out operations in the controlled areaand outside this area. Civil engineering.	**N/A***

		Lab tests for construction materials				
COMPANIES SPECIALIZED IN PROVIDING PROJECT MANAGEMENT SERVICES, ENGINEERING SERVICES, DESIGN, RESEARCH AND CONSULTANCY SERVICES						
32.	**CELIN SRL**	**Research, development and design** for: systems, facilities, equipment and services related to the electric component of nuclear power plant/nuclear facilities of 400 kv maximum voltage, automation of processes, minute current systems (fire prevention and extinguishing, public warning, voice communications, PC networks, access control), systems, facilities, subassemblies and services for technological and mechanical systems of buildings, outdoor networks.	NO	NO	N/A	**N/A***
33.	**ENERGOTECH**	**Consultancy/technical support:** For reviewing versions and determining the optimum solutions during the phase of design works and/or investment in relations with entities involved in the project and/or investment, for selecting and coordinating the tuning operations of control-protection, monitoring and metering systems, etc. Design (engineering) control – protection systems (including tooling); metering systems (including tooling); monitoring systems (including tooling); protocols for complex tests and trials at the equipment supplier, after tooling (FAT) protocols for complex tests and trials after commissioning (PIF/SAT)	YES	YES	Supply activities and services for electric power systems.	**N/A, AQAP 2110/2016**
34.	**ICSI - Rm. Valcea**	**Overseeing the activities for heavy water clastic system execution** **Class 3 manufacture** of heavy water gauges, sequenced filling and catalysts for heat and mass exchange, distilled water by isotopic separation, turbo-molecular pumps, cryogen thermometers, pure heavy water containers, column segments, isotopic exchange columns and related maintenance equipment. **Class 3 services**: testing of gas and gas mixtures from nuclear power plants, technical support for commissioning of manufactured and delivered equipment, cleaning of segments of heavy water reconcentration systems, heavy water certification, hydraulic and tightness tests for systems, elements, equipment of nuclear facilities, monitoring of environmental factors, physical, chemical and isotopic tests executed in the influence area of power plants.	YES	YES	D2O purifying systems from CNE Cernavodă have been executed based on the collaboration with ICSI. D2O purity standards	**N/A*** **SR CEN ISO/TS29001-2015**
35.	**IFIN-HH**	**Decommissioning** of VVR research reactor and use of used nuclear fuel storage. **Notified test lab** for environmental samples, determination of	YES	NO	Radiation characterization of the location, personnel training, testing of	N/A* ISO 11137

		tritium content, carbon-14, lead-210, strontium-90, uranium and thorium content.			nuclear materials, radioactive waste collecting activities	
36.	**KINECTRICS ROMANIA (former AMEC NUCLEAR RO**	**Consultancy** and technical support for nuclear security services and support for certification of nuclear facilities, stress tests on nuclear and non-nuclear pipelines; in collaboration with AMEC NSS Canada and AMEC NUCLEAR UK, it covers the entire range of design and engineering services, in terms of operating support, as well as in terms of new nuclear projects in Canada, Great Britain and third party markets. **Use of software products** for designing, analysis and calculations for nuclear and thermo-hydraulic security, stress analysis, etc., applicable to nuclear power plants.	YES	YES	Risk analyses, vibration range assessment and stress tests for CNR Cernavoda facilities, including during Unit 2 construction phase. Periodic Nuclear Safety Review for Unit 1, in collaboration with AMEC NUCLEAR UK and update of Final Safety Report for Unit 1. "Owner Engineer" (2009-2010) in AMEC, Iberdrola Engineering and TRACTEBEL consortium during the pre-project phase of Units 3 and 4, layout surveys.	**N/A* Certified by CANPAC, COG, NUPIC, SCC, TSSA**
37.	**IPROCHIM S.A**	**Design** of machinery, equipment, systems, technological and utility networks, power and lighting systems, automation, construction and general plane, environment protection works, technical support, consultancy and technical inspections, installation of equipment and technological systems, technical and economic assessments and reviews	NO	NO	Design of mechanical structures and systems, AT D2O production facility	**N/A* ISO/CEI 1702**
38.	**ROMELECTRO S.A**	Design works for electric power lines and stations, repairs, complex project management.	YES	YES	Design and delivery of electric equipment	N/A
39.	**RATEN/CITON**	**Design and engineering** • Studies and supporting documentation for facilitating the client decisions and marketing • Prefeasibility and feasibility studies • Technical and economic assessment studies • Increasing the efficiency of output profile • Studies for location selection • Concept studies for updating and improving security • Environmental impact assessments • Risk assessment reports • Waste management programmes • Call for tenders and tender assessment reports **Basic design documentation** **Approval and security documentation** **Technical support** **Consultancy** **Research and development**	YES	YES	Design and technical support services. Subcontractor of AECL/ANSALDO consortium for engineering services during the execution phase of U1/U2 investments. Consultancy and support services for operation of Units 1 and 2. AECL subcontractor for pre-project phase of Units 3 and 4.	**N/A***

40.	**RATEN/ICN**	Main business lines are • Physics of reactors and nuclear safety; • Irradiation tests; • Post-irradiation analysis of nuclear materials and fuel; • Irradiation technologies and radioisotopes; • Nuclear materials and corrosion; • Assessment of nuclear fuel efficiency; • Tests conducted outside the reactor; • Characterization and treatment of radioactive waste; • Electronics, instrumentation and control; • qualification tests and trials for nuclear devices, components and equipment; • Protection against radiations, environmental protection and civil defense; • Design of nuclear equipment; • Nuclear prototypes; • Engineering transfer; • Technical quality control and non-destructive tests; • Metrology and computing systems; • Quality management.	YES	YES	Consultancy in the area of reactor physics, fuel efficiency, monitoring of first critical event, manufacture of fuel deficiency detection system.	N/A*
41.	**SOLANCE MINING SRL (former GVC COMPLETE PROIECT)**	**Design activities** Radiologic risk assessment studies, feasibility studies for the development of new uranium mining facilities, mining surveying studies	NO	NO	N/A	CNCAN
42.	**TRACTEBEL Engineering GDF Suez**	**Consultancy** via two separate divisions: **Energy Division** - design of thermal power plants, electric power plants, wind power plants, etc., energy efficiency, transformer line, stations and consultancy in the field of System studies for network connection, Design of heating grids **Infrastructure Division** - design of roads, bridges, railways, hydrotechnical objectives (dams, harbors, etc.), civil engineering and granting consultancy in this field.	YES	NO	"Owner Engineer" (2009-2010) in AMEC, Iberdrola Engineering and TRACTEBEL consortium during the pre-project phase of Units 3 and 4. Design of heating grids within CNE premises	**N/A***

NOTE
N/A means that the relevant company did not provide data showing that it is CNCAN certified
N/A* means that the relevant company, although has not submitted a CNCAN certificate number (as requested in the questionnaire), is CNCAN certified based on the information available to us and the replies given to the questionnaire