



Panel of High-Level Advisors on Nuclear Safety in Central and Eastern Europe and in the New Independent States A Strategic View for the Future of the European Union's Phare and Tacis Programmes

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Foreword

Nuclear safety has been a priority in the European Union's assistance programmes, Phare and Tacis. From 1991 until 1997, budget commitments of 780 MECU have been allocated to the nuclear safety parts of the two programmes.

On the basis of experience gained, the European Commission has concluded that there is a further need to reflect on programme implementation and on modalities for future cooperation based on the priorities stemming from the accession process for the Applicant countries and the Partnership and Co-operation agreements between the European Union and each of the New Independent States.

It is against this background that a group of independent high level experts has been constituted at the beginning of this year and entrusted with the task to give advice on the nuclear safety policies to be applied through the Phare and Tacis programmes. The group included 6 experts with a variety of expertise and was chaired by Jean-Pierre Contzen, former Director General of the Joint Research Centre.

The attached report reflects the opinion of the team of experts and it does not necessarily reflect the views of the European Commission. It is a valuable input to the Commission's work in the area. The Commission will examine the recommendations and will in particular assess to what extent they can be included in its future actions in this field.

Hans van den Broek
Member of the European Commission

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Since the decisions of the London and Munich G7 summits, the situation of nuclear safety in the East has evolved in the right direction; such decisions have provided the basis for defining the objectives of the nuclear components of the PHARE and TACIS programmes. This positive evolution, combined with a new geopolitical situation, notably the process of accession to the European Union of Central and Eastern European Countries, has led to the necessity of redefining the objectives of future EU actions in the field.

Taking stock of the current situation, the Panel has noted that progress has been achieved in reaching the goal of improving the safety level of Nuclear Power Plants, this level depending on both the motivation and the resources of the country. Safety culture is no longer unknown in the East. It has also noted that nuclear energy is and will remain a substantial component of the energy policy of those countries already using it.

In most Applicant Countries, the safety of nuclear power plants has been reinforced through upgrading and modernisation programmes, and the strengthening of their nuclear regulatory authorities. The panel does not foresee major difficulties for Applicant Countries in reaching, at the time of Accession, a level of nuclear safety comparable to that of current EU Member States; to ensure the fulfilment of this goal, a more precise definition of the level of nuclear safety to be reached needs to be formulated.

Problems in three countries require, nevertheless, special attention at this stage : they relate to the early closure of Kozloduy units 1 and 2 in Bulgaria, of Bohunice V1 units in Slovakia and of Ignalina Unit 1 in Lithuania.

In the New Independent States, the nuclear safety situation has also improved but more slowly and with more contrasted results.

Ukraine should remain a priority with the requirement for fast international action on the Chernobyl Shelter and for political pressure from the international Community directed towards the closure of Chernobyl Unit 3 as soon as possible. Loans granted for the completion of Khmel'nitsky 2 and Rovno 4 should enhance this process.

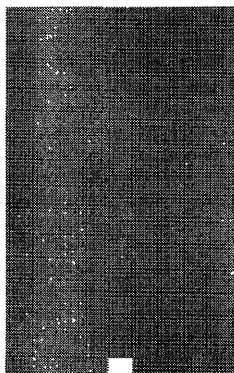
Russia has taken a very independent stance on the issue of safety at its own nuclear power plants and in order to obtain maximum efficiency in the EU support, future actions in the field of reactor safety in Russia should be part of an overall scheme to be discussed a priori with Russian authorities. Furthermore, a new emphasis should be given to issues other than reactor safety such as fuel cycle and radioactive waste management, and safeguards. The Panel strongly believes that in spite of past difficulties in the dialogue with Russia, support should be maintained; it should be based on focused programmes, cooperation rather than assistance and reinforcement of the safety culture of all actors.

Armenia and Kazakhstan do not pose problems of the same magnitude but their requirements for support are real and deserve EU action.

In all countries, Applicant Countries and New Independent States, the Panel considers that a rigid application of conditionality does not necessarily serve the ultimate goal of safer nuclear activities in the East. Political judgement should be exercised before attempting to claim blindly the enforcement of such conditionality.

Other general recommendations relate to :

- The need to move away from unilateral assistance to effective co-operation and partnership, with a much greater involvement, at all stages of the process, by the beneficiaries of the EU support; this is an integral part of the strategy for the eventual



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return to self help. Assistance programmes cannot continue indefinitely.

- The desirability for extending the scope of the EU action beyond nuclear power plant safety not only in Russia but in all countries i.e. to the safety of the fuel cycle, radioactive waste management site decontamination, safeguards, safety of research reactors.
- The opportunity for promoting collaborative R&D between East and West; R&D could be a cornerstone of future contacts with Eastern countries, enlarging the cooperation upstream of technical and industrial support.





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Introduction

Nuclear safety is of primary importance when considered within the context of European Union enlargement: the Agenda 2000 emphasises that nuclear safety is a priority. In addition, political and public concern is being voiced as to the safety levels of nuclear activities conducted within the New Independent States. The response of the European Commission to both these aspects must be commensurate with the challenges which they pose, and this response must be recognised more readily at a public level.

TACIS and PHARE were established along with other EU programmes as support mechanisms through which nuclear safety aspects could be identified and addressed satisfactorily. This was part of the response of the EU to the G7 recommendations following the London and Munich Summits in 1991 and in 1992. As will be discussed later in this document, these programmes have clearly contributed to the improvement of nuclear safety in the East despite the considerable delay in achieving satisfactory results in this difficult area. Evolution of the geopolitical, economic, environmental and technical situations as well as the requirement for management improvements justifies a review of these programmes and the elaboration of a strategy for future actions and their subsequent implementation. To this end, a panel of high-level advisors was convened to advise Commissioner H. van den Broek on the orientation and implementation of EU support activities for the coming years related to nuclear safety in the Applicant Countries and in the NIS. The terms of reference of the Panel are presented in Annex 1 of this document, and its members have been selected due to their individual expertise in the areas identified by those terms: their details and affiliations are listed in Annex 2.

As part of its investigations, the Panel has sought and obtained detailed information regarding the current situation of nuclear safety and related issues through a comprehensive series of interviews with senior representatives from the services of the Commission and relevant bodies from within the European Union. In addition, visits have been conducted to ministries, official bodies and industries in the Applicant Countries as well as in Russia and the Ukraine. A list of those interviewed during these visits is given in Annex 3.

The Panel would like to take this opportunity to extend its sincere thanks to all those representatives, and also to the European Commission Delegations who facilitated the Panel visits to the Applicant Countries and the New Independent States so efficiently.

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2 - The Panel's Views and Comments on the Current Situation

2.1. - General Considerations

2.1.1 The current state of Nuclear Reactor Safety in the East

The strategic objectives of the West (G7) for improving nuclear safety in the East were established at the outset for the nuclear parts of both the TACIS and PHARE programmes which were focused accordingly almost exclusively on reactor safety issues. The Panel feels that the programmes have made useful contributions to the improvement in the safety of Eastern Reactors and have provided much needed technology and safety culture transfer. It has allowed Eastern and Western experts to become familiar with their respective technologies and operating procedures, providing much needed understanding for the to establishment of credible working relations. However, these programmes have not been as effective as they could have been, and significant procedural and management problems have lead beneficiaries to move away from TACIS and PHARE reducing the impact of these EU programmes. These limitations are discussed in detail below, and recommendations are made for the future.

The 1992 Munich summit focused on reactor issues and called for the early closure of the units of VVER and RBMK designs. So far, no Eastern country has implemented plant closures, some six years after the beginning of the programmes but safety improvements have been undertaken. In the intervening years, a great deal more has been learned about the Russian designs, and in some countries, significant investments have shown what can be done by way of safety improvement even for the older plants. In principle all of the countries have their own reactor safety upgrading programmes for their particular reactor types. This recent experience has lead the Panel to the following key elements concerning these reactors which we believe should form the basis of a future strategy.

These items also underpin the costed scenario given in section 3.3, and the specific strategic recommendations by country given in section 2.2.

- **The Treatment of Older Plant : The oldest VVER 440/230 and the first generation of RBMK designs:**

These reactors have safety deficiencies primarily concerning their ability to cope with accidents which are normally safeguarded against in Western designs. Back fitting of necessary safety systems is impractical. As long as only normal operational transients/upsets are encountered, these reactors, with the safety improvements now known to be possible and economic, can be operated for a short time without excessive risk (the "time at risk" argument). However, life extension, or even extended operation, is highly undesirable and the Panel is clear that TACIS and PHARE funds should not be used to allow extended operation, nor, in any circumstances, life extension.

- **The Later VVER type Reactors (213 and 1000 designs)**

The Panel believes that pressurised water reactors of these later designs can be upgraded, by means of improved instrumentation and control, maintenance,

testing, operational safety improvements and the inclusion of mitigative features, enough to justify their continued operation up to the specified lifetime.

- **The later RBMK type reactors**

The Panel differentiates the second and third generations of RBMK reactors from the earliest, first generation, because of their designed capability to deal with some kinds of severe (i.e. fuel melting) accidents. The Panel recognises that the channel type reactor is fundamentally different from the more familiar (in the West) pressurised water reactor. In this, the requirements for containment function are different and provisions in later RBMK designs are adequate for the design basis fuel melting accidents.

If these reactors are continuously updated and well maintained, they could be treated, in terms of their capacity to cope with design base accident, in the same way as the later designs of VVER reactors as detailed above. However, we must point out that apart from the special cases of Lithuania and Ukraine (Chernobyl), all of the RBMK reactors of this type are in Russia and hence the future strategy should focus on the difficulties and needs of this country. In particular, a coherent safety improvement programme within Russia is a fundamental requirement for any extensive future safety improvement strategy. Experience would indicate that such a programme is not going to be easily achieved.

The special cases of Ukraine and Lithuania are treated in section 2.2.2 and 2.2.9.

- **Reactors of Western Origin**

Two nuclear installations in the East use reactors of Western origin. In Slovenia, it is a US built PWR. The situation in this country is discussed in more detail below, but the Panel believes that this is reactor is maintained, operated and regulated very much to Western standards. Whilst continued vigilance is, of course necessary, the panel is not aware of any safety issue which would justify EU action. In Romania, they operate a Canadian designed CANDU reactor and here there are significant potential problems associated with the proliferation of nuclear materials. These are discussed in the section 2.2.10.

2.1.2 The Economics of Nuclear Power in the East.

- **Energy options**

When evaluating the overall economics of a component of the energy (or other) sector, the analysis should involve a full accounting of the costs and benefits to Society of the choices in question. Thus, an evaluation of the total costs of nuclear power or e.g. coal power would distinguish the private costs of fuel labour, capital etc., and the external costs in terms of potential damage to health, ecosystems and life support processes, addressed to the full fuel cycle from mining to waste disposal, and in the case of nuclear, proliferation and safeguards. However, such an evaluation is beyond the scope of this report. Here we just want to present the energy policy environment as it was presented to us in the countries visited as a background to our strategy analysis.

In all countries visited, the Panel encountered a very strong commitment to maintain and in some cases to expand the nuclear sector. This enthusiasm derives from a variety of factors, which are outlined below, including the relative unattractiveness of the available options, and the fact that some of the potential costs would not be borne. In shaping policy, it is important too understand the logic which is driving the support for nuclear within the Applicant and NIS countries which have nuclear capacity. Thus, we make no implications as to the overall economic costs and benefits of the sector.

In all of the countries involved in this review, nuclear power is a low-cost energy source and for them it is clearly cheaper than any foreseeable alternative. The operating costs, including an allowance for decommissioning, are low, at about the same level as in Sweden or Finland. They might be even lower if there were an international market for VVER fuel. Low salaries and more general social cost considerations generally compensate for the still high, but decreasing, staffing

levels of plant. Even the figures, which the Panel has studied for investment costs indicate that new nuclear is also cheaper than any alternative. Hydro-power may be a competitive alternative, but in most cases only as a load-topping capacity since non-exploited hydro resources are limited and in any case are generally of small unit size and hence relatively high cost.

On the conventional thermal side, low-productivity mining sectors in combination with extremely low quality coal or lignite make solid fuels, and hence energy production derived therefrom, expensive, even without the additional costs of flue gas desulphurisation (FGD). Thus, additional internal investments in FGD are difficult to justify. Consequently a large share of the conventional thermal capacity is obsolete or close to it. This is especially true in the relatively large Ukraine. However, there is a case for maintaining a certain share of fossil fuel capacity in order to retain a strategic energy balance. In reality, the slow restructuring of the inefficient and overstaffed mining sectors is probably the main reason for keeping much of the coal fired capacity alive.

In the future, combined cycle gas fired units will claim an increasing market share, especially for co-generation in urban areas and in heavy industry as that recovers. The uncertainty in natural gas pricing make predictions and assessments of future generating cost uncertain. The Panel is of the view that the cost level will be similar too, or somewhat cheaper than coal fired plant based on clean coal technologies.

• **Opposition to closure of Nuclear Power Plants**

In all countries visited, we have found a strong opposition against closure of nuclear units.

Several reasons were put forward for this.

- A nuclear power unit represents an important capital asset also in the Western economies, even more so in poorer applicant countries and the NIS. Thus, the closure of a unit or some units with several years of remaining life-time is not a trivial economic sacrifice for a poor country but represents a substantial capital loss.
- If increased import of fuel or direct electricity is necessary after a closure, a term of trade effect will arise. This effect may be serious in the East-European context since most countries have severe current account deficits.
- A closure will increase the domestic price of electricity worsening the competitive situation of the domestic heavy industry and make it even more difficult to restructure and privatise large electricity using enterprises.
- In the case of a more extensive closure of several units, macroeconomic effects will also arise. Wages and salaries have to adjust downwards and with sticky nominal wages, there will be an inflationary pressure on the economy.
- A closure will increase the (discounted) costs of nuclear power by bringing the costs of decommissioning closer to the present. All applicant countries have initiated a levy scheme to generate ring-fenced funds to finance decommissioning and associated costs. However, without extending the productive life of the units, sufficient funds will not have accumulated to finance decommissioning.
- A closure may also require strengthening of parts of the national transmission grid caused by increased electricity import or other locations of new generating plants.
- Meeting limitations on greenhouse gas emissions according to the Kyoto Convention on Climate Change may have a major impact on the cost of a closure, since alternative options may be much more costly. This may be less relevant for the NIS, where emissions are far below 1990-levels and economic growth slow, but more relevant for the applicant countries, which have agreed to reduce emissions of six greenhouse gases by 8 % by

2008-2012, while Russia and the NIS agreed to stabilise their emissions, using 1990 as base. Slovenia already in 1995 exceeded the 1990 CO₂ emission level by 8 %, while Poland was close to the 1990 level. With slow economic growth, however, most applicant countries are likely to meet their targets by a significant margin but if economic growth takes off at 2-3 % per year, most of them would probably have to undertake actions not to exceed their emissions target. In this time perspective there will be a real cost involved to them in replacing nuclear power with carbon producing sources.

Set against the costs of closure are the potential benefits. If the unit(s) in question are at risk of having an accident, closure will reduce risk of damage to health, to ecosystems and life support systems generally. And there are the future costs of decommissioning which may not be fully internalised in the price of electricity. The benefits of closure are probabilistic and in the future and in some cases cross-frontiers, while the costs of closure are borne within their own borders with certitude today. Here are the rationale for international assistance.

All these aspects explain, at least in part, why countries try to avoid closure and in the light of these considerations it is perhaps not surprising that the Panel found strong political support for nuclear power in these countries.

- **Market reform**

The applicant countries are all in different phases of electricity market restructuring and privatisation of electricity generation and distribution. This raises a concern for the ownership and organisation of nuclear power plant. So far, the view is that nuclear power will remain in the public sector for the foreseeable future. If this were to change, the onus on strong and independent regulators would then become much stronger.

Another aspect of electricity market reform is the EU minimum requirement for Third Party Access (TPA). The main impact of this is a much closer integration of previously isolated electricity, markets and the inevitable increase in import and export of electricity. The benefits for nuclear power of increased international integration are large, especially in those countries with a large share of nuclear generation. This includes, for example, Bulgaria and the Czech and Slovak Republics. In such countries increased international integration would provide a substitute for back-up power as reserve capacity to nuclear power, especially in the case of sudden outages. Thus, upgrading international links may be an economically viable substitute for costly hydro reservoirs, pump storage plant and gas turbines. The import of electricity for short periods, perhaps with economic assistance (see section 3.3) could facilitate, or even make possible more time consuming upgrading and performance improvements of some nuclear units.

- **Future electricity demand**

This important question is discussed in detail in [Annex 4](#).

Future development of all forms of energy and in particular nuclear energy is linked to the evolution of electricity demand in the applicant countries and in the New Independent States; this has been an element of debate and controversy in a recent past, in relation to the issue of closure of older plants. The panel believes that future electricity demand in the East will mainly be driven by the economic growth process; this means that future electricity demand should grow at about at the same rate as the general economic growth in the East; it also means that the large uncertainty about future economic growth translates into an equally large uncertainty about future demand for electricity.

- **Funding issues**

The implications of the condition of public sector financing and deficits in virtually all of the countries are important for our work since this implies severe difficulties in expanding public expenditure. This has been exacerbated by the IMF's very active role in these countries in supporting the very necessary macroeconomic stabilisation process by imposing very demanding constraints on public expenditure. On the other hand, at least in the Applicant countries, the Utilities are able to finance their own investments (even in Bulgaria) for safety and

performance improvements. Thus, the need for direct financial support from the EU for reactor improvement projects is rather limited. This has influenced our thinking to the point that we believe that the most important area for the future lies in support of those parts of the infrastructure which are publicly funded and play an important part in guaranteeing all aspects of nuclear safety. We shall see again later that this is one of our reasons for foreseeing the need to shift emphasis into support of environmental issues, particularly the clean up of uranium mining activities and the development of much stronger environmental ministries and agencies, the improvement of the safeguards capabilities, the care of research reactors, the safe operation of radiation therapy centres and a general need to support nuclear safety research activities. This is, of course in addition to the most obviously important aspect of publicly funded activities, that of the regulatory bodies themselves. These new directions will be described as appropriate in the discussions to come.

2.1.3 The magnitude of the financial effort to upgrade nuclear safety in the East

Detailed cost estimates of the amount required to bring all nuclear installations in the East to a safety level equivalent to Western practices are not available and would require considerable efforts for their evaluation.

Nevertheless, in order to give a rough indication of the magnitude of the effort, the Panel has conducted the following reasoning: limiting itself to nuclear power plant safety, the Panel has compiled the following figures:

- safety upgrading of a VVER 440/213 unit : 75 to 200 MECU
- safety upgrading of a VVER 1000/320 unit : 100 to 150 MECU
- safety upgrading of a RBMK unit : 100 to 150 MECU

(the large spread in estimates is due in part to assumptions about the contribution of Western Countries to such upgrading)

In the NIS, there are 4 VVER 213, 18 VVER 1000 and 12 RBMK reactors; if all were upgraded, this leads to a cost of 3.3 to 4.3 BECU. In the Applicant countries, there are 12 VVER 213 and 4 VVER 1000 reactors; these upgradings are assessed to be about 2 BECU.

Even considering that the financial efforts for Applicant Countries would be borne by the countries themselves (which is a significant effort indicating a positive trend in safety culture), the amount for the NIS remains so large that it exceeds by far the effort which the European Union could afford.

Costs for support to adequate spent fuel storage, radioactive waste management, decontamination and decommissioning are not included in these rough estimates but could easily correspond to an additional Billion ECU or more.

In the NIS, the size of the investment required and the extended time scale over which improvements must be maintained means thus that the only realistic strategy for EU support is to ensure progress to self help and a well focused, independent regulatory authority and to contribute to environmental restoration. Progress towards these goals should underpin the EU's forward strategy.

2.1.4 The particular issue of conditionality

The Panel has come to the conclusion, after many detailed discussions with both potential beneficiary countries and various interested parties from the EU that a rigid requirement for conditionality, and especially plant closure agreements does not contribute to the principal objectives of the programme, i.e. improving nuclear safety. Since this has been a rather basic principle in previous years, some words of explanation are appropriate. Our rationale is based on the following:

- For many countries, the amount of money made available by the West is small compared to that needed to reach Western Standards. The leverage

available is therefore small, and tough conditions are unlikely to be acceptable or implemented.

- Safety requirements and the approval for operations must remain with the local regulator. Any "conditions" must be consistent with their own requirements and not based on our perceived needs; in this regard, a strong local regulator is a key requirement.
- Some countries remain convinced that their reactors are safe enough and will accept with difficulty a technical argument to the contrary. The dialogue should be pursued nevertheless, with a view to bridge gaps and maintain, in spite of differences, the common objective of nuclear safety enhancement.
- Experience shows that even apparently technically soundly based conditions can become difficult to achieve, as technical knowledge or capability evolves.
- The programme procedures have meant that some countries with well developed technologies have been treated in a patronising way; adding conditions to assistance only serves to heighten these sensitivities.
- The slowness and lack of sensitivity of programme management means that many countries do not consider TACIS/PHARE grants for immediate, and therefore important, safety upgrades. Since this funding stream is considered as a welcome addition and not a vital element, the imposing of onerous conditions is that much more difficult.

Having made this case for the softening of conditionality, we wish to emphasise that softer conditions does not mean that there is no need for a strategy. Indeed, it makes it all the more important that there be an overall vision and purpose to the programme if individual projects are not to be subject to rigid conditions. This theme is returned to in many places in this report, and, of course in our main recommendations.

The Panel believes that the way to ensure that the future operation of all the plant in these countries is as safe as possible is to work through and with the regulatory authorities who have the necessary legal and sovereign powers. This imperative applies to all countries and hence a general reinforcement is required. There are significant variations in the scale of the need. Having said that, it is also important to work with the Utilities to ensure that they share the development in safety culture, where motivation of staff is a key issue. This improvement has already been seen in some of the countries, but again there are some significant variations which we highlight later. It is clearly important to maintain and to strengthen links already established with Eastern regulators and Utilities.

Associated with the conditionality issue is the treatment of the beneficiaries. This is discussed in more detail under management issues below, but our basic finding is that there should be a deliberate shift in terminology from beneficiary to collaborator or partner. For the majority of the countries involved, we are dealing with experienced and well trained engineers who are well aware of the technical issues and the needs for their resolution.

Finally, any future programme must be realistic; it must not raise expectations on either side in excess of the funding available and needed.

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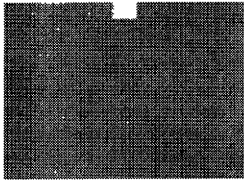
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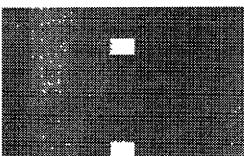
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2 - The Panel's Views and Comments on the Current Situation

2.2. - A detailed Appraisal of the Position in the Various Countries

General

The general aspects of nuclear reactor safety which the Panel believes should be addressed have been outlined above. However, as we have said, there are significant differences from country to country and these call for the more detailed analysis which we present in this section. Therefore, here we specify the Panel's views of the key strategic issues on a country by country basis. Because of the major differences between the countries of the NIS and the Applicant Countries, we make an initial classification along these lines.

New Independent States (Russia, Ukraine, Armenia, Kazakhstan)

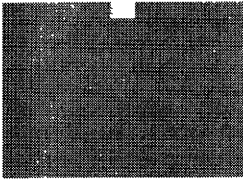
The analysis is concentrated on 4 countries, [Russia](#), [Ukraine](#), [Armenia](#) and [Kazakhstan](#) in view of the presence of Nuclear Power Plants in these countries.

Other NIS countries may have specific problems related to nuclear activities, for example the recent difficulties over the security of the research reactor in Georgia. However, the Panel has not made any attempt up to now to investigate such additional problems, which should, in any case, be of a lesser priority than those encountered in the four NIS analysed in the report.

Applicant Countries

Poland, Latvia and Estonia do not operate nuclear plant and there appear to be no current significant problems related to nuclear safety in Poland and Latvia, there is a potential problem in Estonia concerning the clean up of Uranium mine activities at Sillamae. For the others countries ([Bulgaria](#) - [The Czech Republic](#) - [Hungary](#) - [Lithuania](#) - [Romania](#) - [Slovakia](#) - [Slovenia](#)), there are Nuclear Power operations and so each country is treated individually following the discussion of some generic issues.





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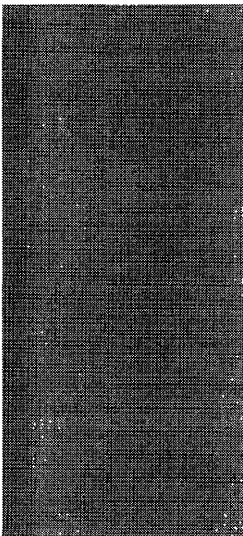
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1. Russia

Russia represents the largest and most complex country of the NIS. As the primary source of all the reactor technology, and the Institutions responsible for it, it continues to play a pivotal role. Even the crudest cost estimates (see section 2.1.3) show that even the total Western assistance cannot make a significant contribution to the investment needed to upgrade all of the currently operating plant, even supposing that the Russian Authorities would accept such a large contribution, with its associated political dimension. Hence the requirement for a clear strategy for nuclear reactor safety in Russia, based on mutual respect and seeking to maximise mutual benefits.

The forward strategy has to be based on focused programmes, co-operation rather than assistance and especially towards the development of a satisfactory safety culture for designers, operators and regulators. The key strategic requirement is for a transparent, coherent and agreed plan for safety improvements in all sectors of the nuclear industry.

This has not been achieved in the past; the EU support programme in the area of reactor safety has most probably been welcomed at local, nuclear power plant level but does not enjoy much appreciation at higher level (ROSENERGOATOM and MINATOM). The Panel suggests therefore to revise the EU approach limiting the actions in the area of reactor safety somewhat below the initial ambitions but at a level sufficient for continuing collaboration and maintaining the dialogue.

The revised approach is based on the condition that the high level decision makers, primarily in MINATOM, can be persuaded to participate in the elaboration of the fundamental plan referred to here above. The new ministerial team at MINATOM needs to be convinced about this approach which is essential if the EU wishes to maintain its support programme.

In the new approach, conditionality will have to be treated with great care; the recent case of the restart of Kursk 1, ignoring the conditionality clause of the NSA grant to Russia, shows how difficult it is to have it implemented.

Continuing collaboration should be based on the following principles:

For reactor safety :

- a. The concept of the evolution towards co-operation rather than assistance should underpin all future projects in design safety, on site assistance and strengthening the regulatory bodies.
- b. Generic safety issues (design, operation and maintenance) should be given priority over single plant issues. However, it is vital that when generic safety work is done, its results are made available to all parties in Russia, other Eastern countries operating the same type of reactors and to relevant parties in the West.
- c. On site assistance considered to have been one of the most successful of the assistance programmes. However, the need for this kind of assistance

has diminished as the programme has achieved much of its original intent. In future, OSA could be reduced to a Regional presence, with attendance on-site on an as needed basis.

- d. Fewer, larger scale projects are preferred, but again some resistance from the country is anticipated because of the implications for a more strategic approach commonly agreed a priori.
- e. Future projects/contracts should be planned and implemented with much closer involvement of the beneficiary countries. In Russia, the Joint Management Unit (JMU) may offer the right vehicle for taking this forward.

For Fuel Cycle Management :

As discussed in section 3.1, the Panel believes that Russia should be the proving ground for a major international undertaking on the stabilisation and relocation of highly active material, arising primarily from spent fuel reprocessing and nuclear submarine fuel. The problem exists in many places, but is particularly severe in its North West region in relation to submarine fuel.

There is increasing international attention and concern now being generated by this issue and the Panel believes that the EU should take a significant initiative in providing technical assistance to resolving a threat which is close to its own back door.

As with the reactor issues, the scale of the problem is very large and therefore the use of available resources from the EU has to be focused in those areas which are most critical and where maximum leverage can be obtained. The expectations of a project focussed on N.W Russia must be realistic and consistent with its size. It is clear that such a project must be conducted with other donor countries, especially the Nordic states (the Baltic Alliance) and the USA and must be the result of comprehensive discussions and agreement with the relevant Russian authorities. This is a particularly sensitive area and an appropriate balance must be struck between the donor objectives and the beneficiaries requirements and national interests. The EU should play a leading role in the implementation of this project and ensure that its contribution is visible and recognised.

The justifiable focus on North West Russia does not mean that the situation elsewhere, especially east of the Urals should be ignored. The Panel believes that the economic and environmental issues of the fuel cycle/waste disposal issues have to be seen in their entirety, and therefore recommends that a European programme of assistance focusing on safety of the tertiary phase of the fuel cycle (storage/disposal) should also be undertaken. The Panel recommends a programme to support the improvement and security of radioactive waste handling facilities East of the Urals mountains as part of this holistic approach. In both uses – N.W. Russia and East of the Urals – it is imperative that clear concepts should be delineated before more practical work be undertaken.

Safeguards :

Support in the field of safeguards should have Russia as its priority in view of the large amount of fissile material in this country. The adequate control of nuclear materials remains a key non-proliferation issue at world level. The Panel recommends that the principle of collaboration, which is already well entrenched, and a transition to self help is applied, with priority going to training (for the trainers), the development of an industrial platform in Russia for the production of instrumentation based on indigenous Russian technology, transfer of methodologies and standards for reinforcing nuclear material control and accountancy practices.

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The tertiary phase of the fuel cycle project mentioned previously requires a supporting project in safeguards and the panel recommends support for a new methodological and training centre to be installed East of the Urals .

Research Reactors:

There are a large number of research reactors in Russia. Many of them are obsolete and located in urban areas. Because they are owned primarily by research organisations with little money available, there is a need to help support their stabilisation and first steps to decommissioning. The Russian regulator in particular has drawn this problem to our attention.

* *

In conclusion, because of the scale of the reactor safety issue, the wide range of technical issues and Institutions involved, but primarily because of lower expectations about the active interest of Russian authorities for it, the Panel recommends a significant shift in priorities for Russia. In particular, we recommend a somewhat reduced on-going programme in the reactor safety area, focussing on the regulatory authority and with sufficient support to utilities and industry to improve design safety wherever possible; this would at least provide for continuing dialogue and the maintenance of communications between the Eastern and Western specialists, from both the Regulatory bodies and the Utilities. The new focus should be on radioactive waste and spent fuel management, specifically the North West Russia problem and the associated environmental recuperation, as well as the development of suitable disposal sites east of the Urals.

A second main area should be that of nuclear materials safeguards.

Furthermore, we see collaboration in R&D as a particularly useful tool at the present time for maintaining the dialogue and reinforcing links the general framework for Science and Technology co-operation between Russia and the EU can be used to reinforce this, notably with the anticipated commencement of the fifth Framework Programme. Multi-national mechanisms such as the International Science and Technology Centre could also contribute in this respect.





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2. Ukraine

Matters relevant to assistance programmes in the Ukraine are dominated by concerns surrounding the Chernobyl site, and knock on effects from it. Much of that is being considered in broader international fora, with the EU one of the players. The Panel believes that the central focus of EU support to the Ukraine should be the resolution of the Shelter issue. The Panel recommends the reinforcement of the EU's pro-active initiative in the definition of the Shelter Implementation Plan and in the setting up of the Chernobyl Shelter Fund, which has been beset by delays and wrangling to the point where some Ukrainian Authorities fear that much of the previous investment (in money and experts' time) is in real danger of being wasted. The real point at issue is that the accident debris, especially the remains of Unit 4 pose a real and immediate threat. It is not a probabilistic threat as is posed by the reactors. The Panel proposes an envelope for the EC contribution to the Shelter Fund in Section 3.3. We believe that it would be both realistic and highly beneficial to increase the funding during the period 2000 - 2004 beyond what the Commission has already pledged.

The key reasons for such proposed increase are as follows :

- The need to remove an immediate threat to a very large number of people.
- The opportunity for the EU to fund a realistic, large engineering problem with very specific and measurable outputs.
- The nature of this particular project which should escape "conditionality" requirements which have always lead to severe difficulties in the past.
- Major reactor safety issues, such as the early completion of Khmelnitsky Unit 2 and Rovno Unit 4 are best left to the auspices of the NSA and other major funding schemes, such as Euratom loans.

If the principal problem in the Ukraine is the Shelter and clean up of the site at Chernobyl, there also remains the difficult issue of the continued operation of Unit 3. At the time of the Panel's visit to the site, Unit 3 had just been returned to service after a very long outage to repair cracks in the main circuit pipe work. Considering that this reactor, albeit of the later type, has not received any safety upgrades (apart from the "standard" post Chernobyl accident changes), is being operated immediately adjacent to the Sarcophagus, which is generally held to be in very poor condition and that the working conditions on the site are far from ideal, continued operation at full power seems to us nothing short of reckless. However, it is, we hope a short term problem in that it appears to be part of a bargaining stance with the NSA over grant assistance to the country; it is not likely to be a long term issue requiring plant safety upgrades to underpin its operation for some years to come. We have, therefore, not included any recommendations for this Unit. Nevertheless, the Panel urges the Commission to take every opportunity to make it plain to the National Authorities that the continued operation of Unit 3 is seen as highly undesirable and a considerable threat to both the Ukrainian people and its international standing. Pressure from

the EU for an early resolution of the completion of Khmelniisky 2 and Rovno 4 would be of great benefit as this would remove one of the principal bargaining cards of the Ukrainian government.

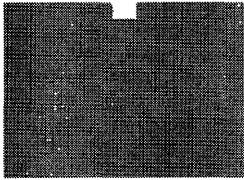
With regard to other Ukrainian Nuclear Power Plants, on site assistance and contribution to Design Safety are important in view to their contribution to Design Safety improvements in those plants where the lack of own resources to perform such improvements is obvious.

In the light of this, the Panels findings for the Ukraine may be summarised as

- The main focus of TACIS support for the next years should be a strong EU involvement in the International Shelter Project, including adequate industrial return.
- Strong support should be given to the Ukrainian regulatory authorities and to the Environmental and Emergency Response Ministries. In this country the problem of lack of resources for public services is acute, and this leads to very large pay differentials between regulator and plant staff. Whilst we recognise that it is not possible to directly pay the salaries of staff, we believe that additional assistance should be made available in the form of support to travel to EU countries for meetings and training, for closer communications with colleagues from the EU in Ukraine and, if necessary, hardware and software.
- Every opportunity should be taken to bring pressure to bear on the Ukrainian Authorities to close Chernobyl Unit 3 for good. Early resolution of the financing issue for the completion of Khmelniisky 2 and Rovno 4 could help in this respect.
- Ukraine is keen on Site Assistance and contribution to Design Safety and so we believe that these types of support should be continued as long as they are welcome.

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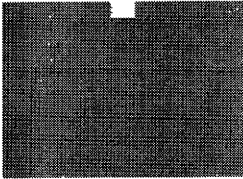
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3. Armenia

The economic and social conditions in Armenia remain fragile. The Medzamor plant (VVER 440/230) is playing a central role in maintaining the growth in the economy, and providing a basis for stable political development. The continued operation of

the plant for several more years pending the implementation of an overall energy strategy seems to be an inevitable pre-requisite for the future development of the country. The ongoing EU assistance should continue and should focus on short term improvements of design safety through on site projects, remediation of, key technical deficiencies (such as emergency preparedness and the means for extensive non-destructive testing) and support to the regulatory authority. The Panel notes that some bi-lateral assistance also comes from the USA and it is important to co-ordinate any future projects, especially in relation to the regulatory body.





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4. Kazakhstan

Kazakhstan has enormous problems in the form of site contamination and the location of potentially hazardous radioactive wastes. This country has had relatively little attention paid to its problems and what seems to be needed is an assessment of their true extent, followed by the development of an agreed comprehensive strategic plan. This could be part of preparation for possible later more specific, realistically sized, assistance programmes.

Kazakhstan has recently announced plans to order 3 Russian VVER Units of 640 MWE, starting operation in 2005. The operation of such plant place new requirements on the Regulatory Authority and it would be worthwhile for the Commission to investigate the use of TACIS funds to support this Authority.





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Poland, Latvia and Estonia do not operate nuclear plant and there appear to be no current significant problems related to nuclear safety in Poland and Latvia, there is a potential problem in Estonia concerning the clean up of Uranium mine activities at Sillamae. For the others countries, there are Nuclear Power operations and so each country is treated individually following the discussion of some generic issues.

5. General

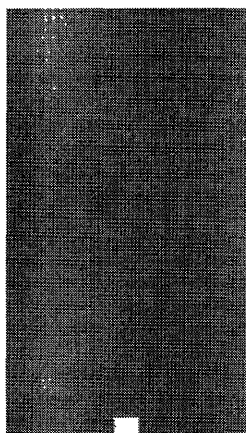
The EU has placed a requirement on the Applicant countries to reach "Western Standards" by accession. Since there is no legal document defining European Nuclear Reactor Safety Standards, the guidelines against which the countries can judge their level are not clearly defined. One way forward which the Panel recommends, would be for the Applicant Countries to apply in their areas of jurisdiction the regulatory practices of any of the established nuclear operating Member States. It does not seem important which of the established regulatory schemes is adopted as long as it suits the needs of the applicant country; what is important is that the country adopts the chosen scheme in its integrality.

If no understanding is reached on this issue, there is the real danger that applicant countries will fill the vacuum by adopting the US Nuclear Regulatory Commission approach. This would, in our view, be detrimental because this system is different in principal to those of EU countries in that it is prescriptive. This is because it was developed for a country operating more than a hundred reactors, owned by many different Utilities, and coming from different suppliers. The more usual interactive system adopted in Europe is much more suited to the needs of these small countries with relatively few plant, which are of very similar design.

For many of these countries there exists a well developed nuclear research infrastructure. The Panel believes that additional resources and mechanisms should be put into place to ensure that the experience gained is both retained and made available through collaboration to EU Institutions. We understand that there will be

possibilities for collaboration in the upcoming fifth Framework Programme and this is laudable; however, because we attach great importance to strong interactions between the research communities, we encourage even more efforts from the Commission to support this area.

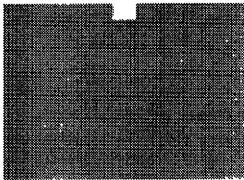
Taking nuclear safety in its widest possible meaning, the Panel have noted that the environmental aspects need to be strengthened as most of the institutional structures are not well developed in these countries. For the Applicant Countries, it is important that the environmental dimensions of the nuclear sector be addressed so as to conform with existing and emerging Union policies in this regard. Specifically, this requires that there be:



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- adequate information on environmental performance across the full nuclear cycle; most attention heretofore has been addressed to power plant operation
- access by the public to information on safety and emissions performance which meets modern standards of clarity, transparency and timeliness
- appropriate technical, administrative and managerial capacities in Ministries of the Environment, backed by relevant statutory and policy formulation and implementation structures. Resources in the Commission itself for dealing with such considerations are barely adequate to meet the needs in current Member States and would need to be reinforced.





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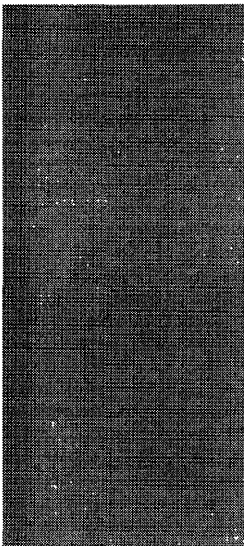
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6. Bulgaria

Bulgaria relies currently on nuclear energy for about 45 % of its electricity production. In 2000, the planned distribution should be (figures in brackets are the objectives for 2010).

Local coal fired power plants	35% (38%)
Imported coal fired power plants	22% (25%)
Hydro power	5% (5%)
Nuclear power	38% (32%)

The importance of electricity production from local coal is notable and will probably have serious environmental consequences.

The Panel noted that in spite of the precarious economic situation, significant improvements have been made in terms of plant nuclear safety and safety culture. This agrees with other international assessments, including a comparison with the situation in 1995 when a member of the Panel made a similar visit.

The Panel was impressed by the expertise and experience of the Utilities Engineering Staff, but the Regulatory Authority did not give a strong impression. This body clearly needs further strengthening in terms of its independent status, its technical competence and its capacity to be ahead in thinking when dealing with a competent nuclear operator.

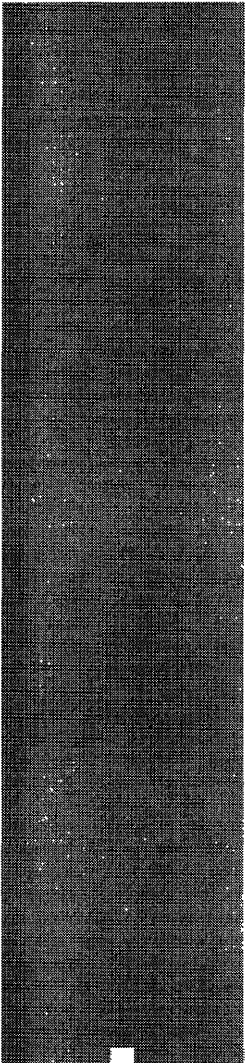
So far as spent fuel is concerned, the country is in the privileged position of still being able to return it to Russia. The interim spent fuel storage facility at Kozloduy, which has been visited by the Panel, has adequate capacity and the IAEA safeguards are fully implemented.

There is a serious problem concerning environmental contamination from previous uranium mining, and this is an area where assistance from the EU would be welcomed.

In the field of nuclear power plant safety, the Panel noted the safety upgrading and modernisation programmes for both VVER-440/230's (Units 1-4) and VVER 1000's (Units 5 and 6)

The modernisation programme for Units 5 and 6 is ready for implementation with a European consortium involving Siemens, Framatome and Atomenergoexport (Russia) with another European consortium selected for consultancy on project management. The scale and focus of this programme is such that it should bring these Units to an adequate level of safety and availability.

Units 1 to 4 have been subject to safety upgrading during the period 1991 to



1997, which was described as a short term Programme. Following an in-depth safety assessment, a further "Complex Programme PRG' 97" is underway for the period 1998-2001 with a total investment of 95 M\$ and a peak annual investment of 37 M\$ in 1999.

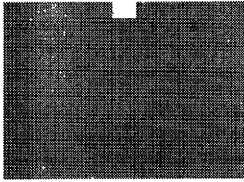
The key issue is the date of closure of Units 1 and 2 in line with the conditionality of the Nuclear Safety Account Agreement. The Bulgarian Authorities wish to maintain the Units 1 to 4 in operation until the completion of the upgrading of Units 5 and 6. Also maintaining Units 1 to 4 in operation for several more years would allow the Bulgarian Authority to accumulate most of the money required subsequently for decommissioning the plant. This is being done by adding 0.5 cents per kWh to the electricity price; this equalises electricity prices for thermal and hydro production, and provides a significant fund.

The Panel recommends that;

- priority should be given to the earliest implementation of the upgrading programmes for Units 5 and 6. Early allocation of the Euratom loan is an important factor in this respect.
- a firm assurance from the Bulgarian Government be obtained that Units 1 and 2 will be closed as soon as the upgrading programme for units 5 or 6 is completed. This implies a closure of the Unit 1 and 2 before the end of the design lifetime, a prospect that Bulgarian authorities do not seem to reject.
- the operation of Units 3 and 4 should be monitored very closely. Whilst these units are younger than Units 1 and 2, they are of the same early design and the continued operation of the plant up to, and possibly beyond 2010, is questionable. The EU should continue to exercise pressure for as early a closure as possible; in the meantime, the implementation of short term improvements must be monitored as they are performed on an as needed basis. All this implies the need for a vigorous support to the regulatory authorities. An on-site presence would be beneficial both to assist the plant and to provide direct progress reports to the EU.

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7. The Czech Republic

The Czech Republic operates 4 VVER 440/213 reactors at the Dukovany site. These represent approximately 22% of the electricity generating capacity of the country. Two VVER 1000 reactors are under construction at Temelin. When these are brought

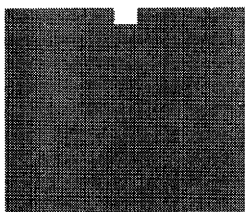
into service, nuclear will represent about 40% of the installed capacity. There are presently no plans to increase the nuclear capability beyond this point.

The completion of the Temelin plant has been dogged by delays and cost overruns due primarily to the decision to replace the original Russian control system with one of Western design.

The safety upgrading programme for Dukovany and Temelin is funded entirely by the owners, the state power company CEZ, and there seems little requirement for additional EU support. No proposals for PHARE funding are planned for the near future, partly based on the rather poor record of slowness and bureaucracy of the programme in the past. The Regulatory Authority appears to be well organised and competent, and there are no outstanding problems and, apart from their request for the EU to define "Western Standards", there seems to be no need for specific EU action.

One area where there is a cause for concern, however, is in the clean up of Uranium mining activities. An environmental action programme is called for and, as with all problems of this kind, the costs are potentially very large.





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8. Hungary

Of all the Eastern European countries, the Panel believes that Hungary is the closest to "Western Standards" and practices. It operates 4 VVER 440/213 reactors at the Paks site. These plant have been subject to major upgrading programmes and in many ways provide a "model" as to what can be achieved in given financial and time constraints for an operating plant. This includes the upgrading of safety systems, operational procedures and interactions with the regulatory authorities. The contribution of Nuclear is at present about 40% of electricity production and the longer term energy strategy is to keep it at about that level. Since the ground rules for new capacity is on a least cost basis, any new plant will have to be competitive. The age of the present plant means that replacement will be due on about a 10 year time frame.

Spent fuel storage and ultimate disposal is seen by them as a key issue. Whether fuel is eventually sent back to Russia for reprocessing, or is retained and eventually disposed of, they still have to make provision for the ultimate safe handling of all this radioactive material. This is an area for possible EU involvement in the R&D required to establish a technically sound ultimate disposal scheme.

Arguably the potentially most useful area for future collaboration is in research, where they have experience and skills on a par with the EU.

In other fields, previous experience with PHARE projects has not been very encouraging; and Hungarian officials do not expect large contributions in the future.





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9. Lithuania

Lithuania is unique amongst the Eastern European countries with nuclear power in that it was a full member of the Soviet Union, and had two large RBMK Plant constructed on its territory. These two reactors at Ignalina can provide up to ~80% of the countries electricity needs and have been the source of lucrative exports of energy. These reactors are of later generation design and have received a good deal of upgrading, primarily through EBRD-NSA and PHARE funding and a local safety improvement programme. Sweden has a very strong regional interest and commensurately large bi-lateral programme. One of the conditions of the NSA agreement provides that the reactors should not be operated beyond the time at which an ageing phenomenon known as gap closure (i.e. the closure of the gap between the coolant tubes and the graphite blocks) requires retubing of the reactor core. Retubing of Units 1 and 2 is not allowed under the terms of the NSA Agreement. In 1994, when the agreement was concluded, these requirements were expected to occur in the range 1999-2002 for Unit 1 and in the range 2005-2007 for Unit 2. Current indications are that this requirement will indeed occur before 2002 for unit 1.

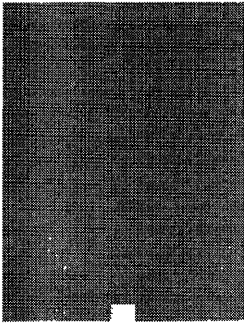
Lithuania would like to keep Unit 1 running as long as possible and might consider retubing. This is against both the spirit and the letter of the NSA agreement and poses a severe test for both the veracity of the Lithuanian government and the resolve of the funding agencies. In this situation, the Panel offers the following findings and comments to the Commission, recognising the multi-dimensionality of the safety, economic, social and political (accession) issues.

In high level political discussions, it must be made clear to the Lithuanian authorities that the EU considers the response of Lithuania to its previous commitment as a test of its international credibility. The Panel believes therefore that the objective and the conditionality of the NSA agreement should be respected, all the more as

- there are sound technical reasons for not supporting the extended operation of this plant, risk increasing with age
- this objective has been endorsed by the EU in the Agenda 2000 and in the Accession Partnership.

This leads to the following recommendations :

- It would be imperative that the international community press for the closure of Unit 1 as soon as the gap closure condition is reached, which should be before 2002, and for the closure of Unit 2 about 5 years later. In any case, there should be no concession on the non-retubing requirement.
- Establishment of an energy plan for the country, based on these closure



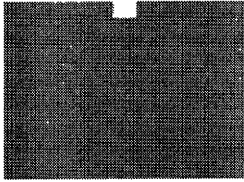
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dates for both Units.

- The upgrading programme being applied to Unit 2, specifically to include the timely implementation of a second shutdown system, should be adequate for it to continue to operate for some time.

Overall, the Panel believes that the technical specialists and the regulatory authorities in Lithuania have made great progress and are deserving continued support.





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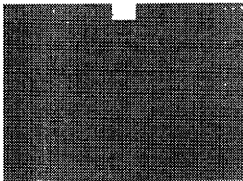
Romania is a poor country and the public finance crisis is severe. The situation regarding nuclear power is different from Bulgaria in that they operate the Canadian designed CANDU type of reactor. So far as reactor safety is concerned, the main worry is the withdrawal of Canadian assistance. This is already at a very low level and the situation could become critical. The EU should monitor the situation closely, with a view to stepping in if the need arises. Sounding out of the Canadians intentions would be beneficial.

Because the reactors are of a very different type to those operated elsewhere in Europe, an important early pre-emptive move would be for the Commission to identify a small team of specialists who still have the expertise from earlier development of this technology in Europe who can provide the necessary technical advice.

For reactors of this type, there is always the threat of their use for producing weapons materials. Whilst there is presently no suggestion that this is part of the Romanians planning, it means that long term safeguarding of the plant is an important consideration. Heavy water production should also be monitored.

There is also a problem with Uranium mine recuperation which is likely to require attention just like Bulgaria and the Czech Republic. No studies are available as yet so we do not know the extent of the problem.





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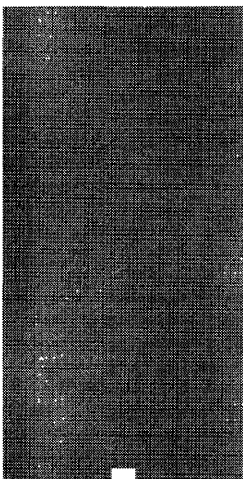
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Without entering into the recent controversy over the start-up of the Mochovce power plant, the Panel notes that the Slovak authorities have conducted an important programme of upgrading of their VVER reactors both at Bohunice V1 (2 VVER 230)

and V2 (2 VVER 213) and at Mochovce (2 VVER 213). The Slovak system is characterised by a strong Nuclear Regulatory Authority relying on well structured legislation for the control of nuclear power. Currently nuclear contributes about 38% of the total electricity generating capacity. The bringing onto stream of the Mochovce units should allow the closure of the Bohunice V1 thereby maintaining approximately a 1/3 contribution from nuclear to the energy mix. The Bohunice V2 units have undergone several upgrading and enhancement activities; once the upgrading of the V1 units which is currently being implemented is completed, a long term programme concentrating on the period 2004 - 2010 for the V2 units will be undertaken. Once achieved, these, together with the upgraded Mochovce units, would meet all of the requirements of Western Practices.

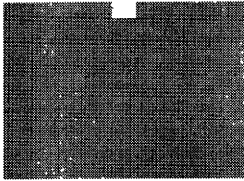
The issue of spent fuel also applies here, but the plan for storage at the power station sites until disposal, as well as the generation of disposal and decommissioning funds through a surcharge of 30% on the electricity price, are expected to provide a sound longer term plan.

Slovakia has to face the immediate requirement to decommission its A1 reactor (gas-cooled, heavy water moderated) which stopped operation in 1977. However, its fuel has already been shipped back to Russia and active planning for the decommissioning is already underway.

The main recommendations for the future are :

- to co-operate with the regulatory authorities to ensure that a strong position is maintained and to facilitate their participation in the activities of their EU counterparts.
- to provide whatever assistance is appropriate to ensure the safe operation of the Mochovce Units as well as the early completion of upgrading the Bohunice V2 units
- to continue to press for the closure of Bohunice V1 units, even if this should occur before the end of their planned lifetimes
- to promote regional co-operation between operators of VVER 213 reactors, as the Bohunice, Mochovce, Dukovany and Paks Units are all similar.





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Slovenia operates a pressurised water reactor of Western design at Krsko. It is a US built plant and therefore well known and in the main is operated to Western standards. The only possible problem of which the Panel is aware is a concern over the seismic capability of the plant. It would be prudent to establish the nature of the concern and of the need for any future actions.

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3 - The Panel's Recommendations for the Future

3.1. - Technical

The Panel has spent considerable time discussing with many parties the lessons, which may be drawn from the previous programmes of assistance under TACIS and PHARE. This has led to many recommendations and much advice which we would wish to draw to the attention of the Commission. Most of this is referred to in situ in the paper where its relevance to either the technical or national context can be seen. Here we pull out the main recommendations to give a more coherent overview of our findings.

1. It is now time to move the emphasis of the interaction with the "beneficiary" countries from one of assistance to technical collaboration.

2. The focus of the future programme should shift from reactor concentrating on reactor safety improvement to other aspects of nuclear safety, specifically, radioactive waste management, the fuel cycle, research reactors, safeguards and safety research.

3. The principal vehicle for ensuring reactor safety is through continued and in some cases increased support for the National Regulatory bodies.

4. For the Applicant countries there is a need to provide a definition of "Western Standards". The Panel recommends that the Applicant countries are advised to choose from the Member States those regulatory practices which most closely meet their needs.

5. The Panel were impressed by the immediacy and need for action concerning the Shelter project at Chernobyl. We recommend that the EU and its industry be more present in the International Shelter Project.

6. In the same vein as the Shelter project in Ukraine, we believe that the focus in Russia should swing towards the stabilisation of the radioactive wastes, primarily in the North West. The Panel should warn, however, that there must be realism in what it can achieve, given the resources needed and available. The Panel also recommends the development of support for the radioactive waste handling and storage facilities east of the Urals, specifically at Mayak.

7. Also applying primarily, but not exclusively to Russia, is the need to enhance support for the development of a sufficient expertise in Safeguards, including training programmes and help towards developing an indigenous instrumentation and measurement capability. Part of this support should go towards a training centre East of the Urals.

8. It is recommended that research reactors are specifically included in the topics for which assistance can be sought, and then invite countries to make proposals.

9. The Panel believe that it would a very cost effective means of achieving the objectives of ensuring continuing nuclear safety and the eventual return to self help by increasing support to research collaboration between the East and EU member states.

10. If we are to encourage countries to close older plant early, then support for the initial decommissioning phases is justifiable.

3.2 The means required for implementation of the strategy : a costed scenario

In order to implement the long term strategy which it recommends, the Panel has considered the issue of its adequate funding. It is obvious that the PHARE and TACIS programmes or their successors would require many billions of ECU's (see section 2.1.3) if all of the safety requirements identified by various Expert Groups had to be financed entirely through this sole channel. This, however is not the case as other funding sources have to be taken into consideration, most notably the countries themselves. In particular, the Panel noted during its discussions in the countries, that most of the Applicant Countries were relying on their own funding for the safety upgrading of their NPP's. This is one of the reasons why the Panel is advocating a transition from assistance to collaboration in the future dealings with these countries. Furthermore, financial support should be directed preferentially to those areas where funding cannot be supplied by sales revenues from electricity and particularly where it comes from public expenditure. This means primarily site decontamination, care of research reactors, safeguards and, most importantly regulatory activities. The Panel, therefore is proposing the following scheme which implies an increase of PHARE and TACIS funding, not on a dramatic scale, but which above all suggests a redeployment of funds on different objectives which are outlined in more detail in our recommendations.

The costed scenario is based on the following structure:

1. Nuclear Power Plant Safety, divided into:

1.1. On-site assistance: for the Panel, this item relates to "soft" activities and should concentrate in the future on management measures e.g. optimisation of maintenance, tendering, two-way exchange of staff.

1.2. Design safety: Beyond studies, this involves supply some of hardware; joint ventures between Eastern and Western suppliers should be encouraged

1.3. Risk Evaluation and Reduction: the support in this area should consist essentially of methodology, data, evaluation.

1.4. Replacement Power: This is not a technical item: it corresponds to the financial support that the EU might provide to compensate for the economic losses (in terms of power or fuel imports) arising from lack of electricity production during safety upgradings of NPP's

2. Support to Regulatory Authorities

3. Fuel Cycle and Radioactive Waste

4. Environmental decontamination

5. Decommissioning of nuclear facilities

6. Research Reactors: This item covers both safe operation and safe closure, the latter appearing as the most urgent need.

7. Safeguards

8. Fund for fast response: a limited fund should be created to allow an immediate response to unexpected situations.

9. Management: the Panel does not intend to suggest figures for this item which is of the sole responsibility of the Commission but wishes to insist on the fact that adequate financial means must be devoted to management. Without such provision, the other amounts are to be

wasted.

It should be noted that this structure does no longer foresee the financing of training centres and simulators, or off-site preparedness and crises centres; the Panel feels that assistance for such activities should be completed by the year 2000 and efforts concentrated elsewhere.

The Panel's report is constantly underlining the differences in approaches to be used for Applicant Countries on one side and for New Independent States on the other side. These differences are reflected in the costed scenario; the Panel proposes two different sets of figures; these figures correspond to proposed annual expenditures expressed in millions EURO during a 5 year period i.e. for the period 2000-2004. Suggesting figures beyond such a time frame would not be realistic and a system of sliding multi-annual financial programming with a mid-term review in 2002 for the period 2002-2006 would be more appropriate.

The costed scenario is reproduced in the table hereunder.

Item	Credits in MEURO/year	
	Applicant Countries	NIS
1. Nuclear power plant safety		
1.1 On site assistance	1	6
1.2 Design safety (incl hardware)	1	20
1.3 Risk evaluation and reduction	2	2
1.4 Replacement power	p.m.	p.m.
2. Support to regulatory authorities	7	4
3. Fuel cycle and radioactive waste	NIL	12
4. Environmental decontamination	20	30
5. Decommissioning	2	2
6. Research reactors	6	NIL
7. Safeguards	2	7
8. Fund for fast response	1	1
9. Management	p.m.	p.m.
TOTAL	42	84

This table calls for the following comments:

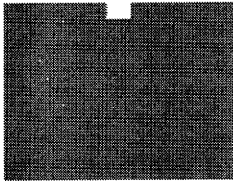
- The ratio of 2 to 1 between proposed overall funding for NIS and Applicant Countries does not reflect political priorities. Nuclear safety in Applicant Countries is of paramount importance but measures to ensure it are essentially financed by the Applicant Countries themselves, while for the NIS help towards self-help must be maintained.
- the difference between figures for On-Site Assistance reflect the greater need in this field in Russia and Ukraine; On-Site Assistance in Applicant Countries should be on an ad-hoc basis
- for Design Safety, the large amount for NIS corresponds to the supply of hardware which should serve as demonstration in a particular plant. The selection of hardware projects should be based on the prospect to see the beneficiary country applying this demonstration to other plants.

- Credits for Replacement Power, if the principle of such financial intervention were retained, should be decided according to the relevant needs.
- Support to Regulatory Authorities in both Applicant Countries and NIS should concentrate on the provision of specialised expertise, training, support to participation of Eastern regulators in visits to, and meetings in, the EU
- For Fuel Cycle and Radioactive Waste, the Applicant Countries can finance their own relevant activities; for the NIS, the 12 MEURO per year are equally divided in 6 MEURO/year for the EU support to a N.W. Russia integrated project, and 6 MEURO/year for the EU support to remedying the most urgent problems around the MAYAK site, including the construction of storage pools.
- For Environmental Decontamination, the sum under NIS is only for the Chernobyl Shelter Fund (in view of the priority of this project, the Panel considers a sum over 5 years, which clearly exceeds the current EC commitment; this should be reflected in increased industrial participation). The sum under Applicant Countries - 20 MEURO/year - should cover the nuclear specific aspects of the environmental restoration of Uranium mines in Estonia, Czech Republic, Romania and Bulgaria; the more general environmental aspects, as for other areas of mining activities, should be covered by funds intended to promote environmental restoration in general.
- For Decommissioning, the amounts foreseen are essentially for transfer of methodology and expert assistance.
- For Research Reactors, the priority should clearly be given to Applicant Countries. With 6 MEURO/year over 5 years, beyond some very limited support to maintain safe operation, the safe closure of 3 research reactors could be achieved.
- For Safeguards, the difference between the two figures is related to the greater requirement in Russia due to the amount of fissile material spread over its territory; the training centre East of the Urals is important in this respect and links with the initiative proposed around MAYAK.
- For the Fast Response Fund, the provision of 1 MEURO per year would cover the most urgent needs.
- It should be noted that possible contributions to the overall issue of nuclear safety in the East through EURATOM loans has not been taken into consideration by the Panel. This could complement the proposed strategy but the criteria for financing are quite different.

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In the brief period which has been available for it to carry out its work, the Panel has attempted to deliver an independent technical appreciation of the current situation regarding Nuclear Safety in the East and of the actions required of the European Union in this respect. From its findings, the Panel has created a series of recommendations for future action which it submits for consideration to the Member of the Commission who took the initiative in setting it up.

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Annex 1 Terms of Reference of the Panel

Nuclear Safety in Central and Eastern Europe and in the CIS : recommendations of a strategy for future actions of the European Commission.

Background and Objective

Nuclear safety, being one of the fundamental criteria in the enlargement process, is a priority of the Agenda 2000, and requires a clear definition of the actions to be implemented within the Agenda 2000. Furthermore, safety of nuclear installations located within the Commonwealth of Independent States, remains a preoccupation for political circles and public opinion inside the EU and the response of the Commission to such preoccupations has to be better perceived.

The actions led by the Commission through the PHARE and TACIS programmes are suffering from a lack of visibility and are subject to criticisms related to a lack of focus.

These considerations lead to the need for the Commission to review and possibly update its strategy in the nuclear safety sector. This review should be backed by the work of a panel of high level advisors [PHLA], which should provide independent technical advice on the orientation and implementation for the coming years of the PHARE and TACIS programmes and their successors.

The PHLA should assist the Commission in responding to two basic questions :

- how can the PHARE programme be best adapted and implemented to promote the nuclear safety aspects of Agenda 2000 ?
- how can the Commission ensure a stronger focusing of the TACIS programme, reinforce its visibility and improve the coherence between the various donors and the beneficiaries in defining and implementing this programme taking into account the work of NUSAC ?

Method of Work

In carrying out its task, Members of the PHLA should take into account the previous work performed in the framework of the TACIS and PHARE programmes, notably the Nuclear Safety Assessment Study performed by Messrs Hayns, Hicken and Tanguy in 1996.

In addition to priority discussions with Commission Services, the Panel should interview various actors on the scene of Nuclear Safety such as the TPEG, the RAMG, the TSOG, bilateral donors and multilateral organisations.

Task Description

The Panel should organise itself and its work in order to meet the general objective described above. Without pre-judging the outcome of the discussion on this issue, the following tasks can already be outlined:

- a) update of the analysis of the improvement (or degradation), since the last assessment performed in 1996, in the nuclear safety situation in the countries benefiting from the PHARE and TACIS programmes.

b) deriving from this analysis, identification of critical areas which might require intervention beyond the scope of current programmes (e.g. intervention in areas other than nuclear power plants' safety).

c) survey of cost estimates to improve the nuclear safety situation to a level which corresponds to the nuclear safety culture as established in the Western World.

d) analysis of the need to reconsider the form of Western assistance in some areas, taking into consideration the relevant countries' indigenous efforts.

e) analysis of the coherence between EU assistance programmes and other assistance programmes, possible need for improved co-ordination.

f) on the basis of a) to e), definition of preferred avenues for the future EC contribution to the development of long term solutions to nuclear safety problems in the countries under consideration.

When developing such definitions, the following factors should, among others, be taken into consideration :

- how far should the EC contribution be demand-driven and how far should it take into account EC internal considerations (e.g. geographical proximity of EU borders), how far should the concept of conditionality be introduced in the process ?
- how to develop solutions which are consistent with a long-term energy policy of the countries in question ?
- how to transform pure assistance into co-operation involving the relevant actors in both donors and beneficiaries' countries ? (duly taking into account ongoing co-operation programmes in relevant Commission services) ?

g) following the definition of preferred avenues, recommendation for priorities in EC future actions taking into account :

- a realistic framework for EC financial assistance
- the need for improving the visibility of assistance programmes (e.g. through the concentration on fewer, larger projects yielding results which are consistent with the agreed strategy).
- specific considerations related to the accession of Central and Eastern European Countries.

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