different as compared to Lithuania. From these viewpoints it is obvious that VATESI, their TSOs and the Ignalina Operating Organisation have not been able to meet the references standards.

The LAP activities have in many cases generated criticism of the type; the planning was not initiated early enough, the demands on the Operator Organisation was not strong enough, the review by VATESI was not thorough enough, the VATESI assessment was not documented in a proper way, etc. etc. I am sure that VATESI can fill out the list of critique that has been expressed from the Western side. This criticism is the way the Western partners give constructive feedback and the different meetings held are the forum for discussing the feedback. This is the method of pushing towards working methods and standards as in Western practice.

Summary.

The challenge for Lithuania as a country with regained independence was to perform a licensing review in a way never done before in the countty and in a time schedule that was extremely short. The work included establishing of the licensing base, strengthening the regulatory authority and organising the technical support, establish and implement a safety improvement programme, production of the safety case and review of the safety case, and to derive a conclusion regarding whether to issue a licence or not. This was to be done together with other tasks, such as implementation of modifications included in the safety improvement programme at Ignalina, implementation of a new storage for spent fuel and, most important of all, to manage the operational safety at the plant.

The achievements are impressive seen in view of the point of start and in view of the time and resources that have been available. Lithuania has put forward a unique safety documentation of an RBMK reactor and presented an in-depth safety evaluation in full openness to Western experts, giving the unique possibility to compare the safety of the Ignalina reactors to Western standards. VATESI is now putting the final efforts into the review of the licensing safety case and is soon prepared to come to a decision. VATESI has managed their part together with all their other tasks. The co-operation with Western experts have played an important role all along and the assistance has been well received.

The evaluation of the technical safety issues still leaves a number of areas of concern. More work will be required. The status of the nuclear infrastructure in Lithuania can also be criticised on many points. There are in consequence many improvements still to be accomplished in nearly all areas, from improvements in legal bases, in strengthening of the regulatory framework as well as completion of safety upgrading programmes. VATESI can take the responsibility to accomplish some of these but others can only be achieved by decision from the government.

The challenges that lie ahead are the important ones. Lithuania has now identified the points in the nuclear safety area that need attention in the future. The list is long and it includes e.g. a SIP 3 safety improvement programme at Ignalina, a second shutdown system to be installed at unit 2, monitoring of the development of the gas gaps between the fuel channels and the graphite in both reactors, investigations to be started regarding effects of ageing components, safety analyses to be continued e.g. the widening of the PSA into more severe situations, safety assessments of SAR/RSR to be updated and a licence review for unit 2 to be done. And of special importance, the operational safety need to be maintained at highest possible level. This includes improvements in procedures for operation and for maintenance as well as in administration. The implementation of a modern quality assurance system must be carried through. VATESI has ahead of them a continued enormously important task in maintaining the regulatory control of these changes.

I believe that the co-operation that has been established between Lithuanian and Western experts through different assistance programmes is of outmost value, for all involved parties. Co-operation should continue as one element of the challenges for the future.

I wish VATESI all the luck in meeting these future challenges.

REGULATORY REGIME AND ITS INFLUENCE IN THE NUCLEAR SAFETY

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Responsibility for nuclear safety rests with the user of nuclear energy (operating organisation):
- the user must do all safety analysis and all safety inspections that are needed to ensure safe operations
- work by regulatory body must not reduce the thoroughness of the user's work.

Regulatory regime is needed to verify and ensure that the users fulfil their responsibility.

Main elements of nuclear regulatory regime
- national rules and safety regulations
- system of nuclear facility licensing
- activities of regulatory body.

National rules and safety regulations (1)
Nuclear safety is a matter of national responsibility and competence
No internationally binding safety rules exist for nuclear facilities
National rules and safety regulations are needed in every country that uses nuclear energy.

National rules and safety regulations (2)

A small country cannot have a full set of detailed safety regulations

As a minimum every country needs

- legislation that defines the rules for licensing and for the regulatory control of nuclear facilities
- a consistent set of general safety criteria.

General safety criteria could be supported with more detailed regulations and guides, as need for such guidance arises.

National rules and safety regulations (3)

It is most important that the legislation provides the regulatory body with an authority

- to issue safety regulations as needed, and
- to make in all situations its own judgement and decision on what is acceptable from safety point of view, even if the decision cannot refer to a specific regularion.

Consistent safety regulations and guidelines facilitate communications between users and regulators of nuclear energy, and help to avoid harmful changes in plans made by the users and their contractors.

National rules and safety regulations (4)

IAEA safety codes and guides are a good model for respective national documents, although additional details and interpretation is generally needed.

National safety guides could also name specific foreign safety codes or technical standards as generally acceptable references.

Usually it is more practical to assess the applicability of foreign standards in connection with specific applications.

System of nuclear facility licensing (1)

Licensing is needed to assure adequate safety analysis and its independent assessment before start-up of a nuclear facility.

The licensing documentation also supports management of safe operations throughout the facility lifetime.

System of nuclear facility licensing (2)

The licensing documentation must include

- A comprehensive list of safety criteria and other requirements used in the design.
- Description of the plant systems and their design basis.
- Analysis of accidents and other abnormal events postulated in design.
- Probabilistic risk analysis.
- Limits and conditions for safe operations, and their basis.

Regulatory body, main tasks

Regulatory body is needed to

- specify the national safety regulations,
- review and assess the safety documentation presented to support license application,
- make inspections to verify fulfilment of safety regulations and license conditions,
- monitor the quality of work processes of user organisation, and to assess whether these processes provide a high safety level,
- push safety improvements beyond written rules, as need and potential is indicated by experience, research and technical development,
- promote high safety culture,
- promote maintenance and development of national infracture relavant to nuclear safety,
- inform the general public on nuclear events,
- ensure maintenance of emergency preparedness.

Regulatory body, basic requirements

Regulatory body can fulfil its given tasks only if it has

- adequate authority to make independent decisions and to give orders,
- sufficient and competent human resources,
- sufficient financial resources.
- **Regulatory body, authority to act**

Authority of the regulatory body must be sufficient to enforce safety upgrades whenever undue risks are identified, even if this would mean major investment or require a long term outage.

Adequate authority can be achieved only if there is

- formal right to give orders beyond areas covered by specific written rules,
- at the top level of the regulatory body, an ability to focus on important issues and to set correct priorities,
- at the staff level, a professional competence and its general appreciation among the user experts, as needed to convince the user organisation on meaningfulness of the requirements,
- trust by political leadership and the general public.

Regulatory body, potential for authority misuse

A weak ot incompetent regulatory body may easily misuse its authority in a way which results as negative influence in the nuclear safety,

- too ambitious regulatory requirements may prevent reasonable and timely response to obvious safety concerns: "the best is the enemy of the good",
- it is easy to delay or block positive safety developments by insisting additional analysis, tests, or documentation.

Regulatory body, human resources

Competence of the regulatory staff must cover all technical and scientific areas relevant to nucleat safety

- a minimum staff of 20-30 experts is needed, no matter what is the size of the national nuclear programme
- regulatory experts must have at least same depth of technical knowledge as their counterparts on the user side
- a collective in-depth knowledge on each facility and on management of its operation is a prerequisite for meaningful regulatory work.

Regulatory body, financial resources

Regulatory costs, as well as the costs needed to conduct independent nuclear safety research supporting regulations, are an essential part of nuclear power production costs.

A mechanism is needed to collect those costs in full from users of nuclear power, and to allocate them to regulatory activities.

The financial resources of the regulatory body must ensure a staff salary level which is competitive with the salaries paid by the user organisation.

Regulatory body, promotion of safety culture (1)

The relationship between the regulatory body and the operating organisation can influence the operator's safety culture either positively or negatively.

In promoting safety culture, the regulatory body must set a good example in its own performance.

Regulatory body, promotion of safety culture (2)

For setting a good example in its own performance, the regulatory body must

- show good judgement in its decisions
- whenever needed, explain the basis for its decisions to the operating organisation in a professional manner
- intervene in the operator's work in a way that is in right proportion to the safety circumstances
- have internal QA with well defined lines of responsibility, internal communications, and guidelines for all of its own work processes
- have systematic and standardised methods for communications with operating organisation
- be service minded as concerns work schedules and availability of regulatory staff.

MODERNIZATION FOR SAFETY PURPOSES RUSSIA NUCLEAR POWER PLANTS WILL CHANNEL-TYPE REACTORS

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The nineties have crucially changed the Russian policy towards channel-type reactors known as RBMK. After the period of intensive commissioning the new Units (Kursk NPP: 1976, 1979, 1983, 1985; Smolensk NPP: 1982, 1985, 1990), the main financial flow was directed into reconstruction of these Units.

In conditions of economic depression, the necessity of deliberate decision concerning the most optimum resource distribution has become evident. Operating organisations have chosen first generation RBMK Units safety improvement as a general course

The task complicity is conditioned by additional limitations, such as a high power intensity and energy deficit of regions as well as sufficient depletion of unit design resources.

At the Kursk NPP this complexity has been aggravated by the construction of Stage 3, i.e. the necessity to contribute to the construction and installation budget.

The Reconstruction of Kursk Units is conducted by phases. If first post-Chernobyl years the Kursk NPP started implementation of high-priority corrective measures aimed at exigent effectivization of first safety function "Reactivity Control". This task was fulfilled in early 90-s in compliance with consolidated measures and high-priority plans provide in SM-88 and SM-90

The effectiveness of reactor shutdown was fundamentally enhanced. Factually, the integral effectiveness (the product of scram rod insertion velocity by rod length and number) has increased more than 3 times due to increase of CPS rod velocity and their total physical weight as well as the change of rod geometry.

Elimination of "reactivity reverse motion" effect significantly influenced the Chernobyl accident evolution, and sharp decrease of steam void reactivity effect down to the guaranteed value of less than one ß.

The "Reactivity Control" resistance to single failute has also been increased significantly. The task has been accomplished by introduction of new CPS channels, new sets of instrumentation, and also by change of some algorithms (e.g. logical "AND" by logical "OR"). At first phase the Kursk plant failed to fully replace CPS equipment with a new complex system CPS (SCUZ+AZRT). However, the upgrades performed have allowed, considering limited resources, to increase the reliability of the existing CPS up to the level quite sufficient to provide the time needed for fullscope elaboration and testing of new SCUZ. The implementation of this system is scheduled for the second stage of the Reconstruction.

By 1998 at Kursk NPP Unit 1 there were performed some activities in the framework of the Reconstruction - phase 1, particularly the effectivization of second safety function "Core Cooling and Heat removal". These activities include:

- installation of two additional emergency feedwater pumps;
- installation of group distribution header check valves;
- installation of a bypass between RCP discharge header and ECCS header.

Due to these measures the effectiveness of second safety function has greatly increased providing currently the required water flowrate in case of primary circuit tube rupture. The ECCS resistance to single failure has increased, firstly due to scheduled construction of UPS building and diesels replacement.

Much has been done in the area of building and installation for the second phase of the ECCS Reconstruction. The Kursk plant has started the construction of a building for safety systems and installed a second ECCS header. After the second phase Kursk NPP will get full-scale multi-channel ECCS with additional accumulators, pump systems, and diesel-generators. ECCS characteristics will approach the requirements of state-of-the-art standards.