NEWCOMER STATES AND FINNISH SAFEGUARDS SUPPORT PROGRAMME TO THE IAEA

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ABSTRACT

IAEA safeguards is struggling with a financial challenge: regular budget is stagnating while new member states plan to include nuclear energy in their energy mix. These states are called "the newcomer states". To solve this problem IAEA has initiated an ambitious program to raise awareness about non-proliferation regime and producing and publishing guidance oriented to the professionals in the newcomer states.

Finnish Support Programme to the IAEA safeguards (FINSP) supports this mission in two ways. Firstly, FINSP is planning and hosting, together with the IAEA, so called 3S courses to the newcomer states. These courses provide practical level information on the most important aspects needed when a state is taking its steps towards application of nuclear energy. Special emphasis is on operator-regulator interface and implementation of safety, security safeguards, emergency preparedness and public relations. Both the Finnish regulator and the operators have participated in arranging the courses in cooperation. The goal has been to provide a comprehensive view on what is required to run a successful nuclear energy program. So far, two courses have been arranged in Finland, the first in 2012 and the second on 2014. Secondly, FINSP has actively contributed to the development of Safeguards implementation Guides. In 2016 FINSP will participate the outreach activities, which will be organized by the IAEA to make these newly published guides better known in member states.

INTRODUCTION

When a country is planning to build its first nuclear facility, the safeguards infrastructure in the State need to be developed to meet the State's safeguards responsibilities. It is challenging for the State to create and develop the State system of accounting for and control of nuclear materials (SSAC) which is the requirement of the Safeguards Agreement. Enabling the implementation of the IAEA safeguards is main part, but states usually have more broader scope within the non-proliferation treaty (NPT) to ensure that use of nuclear materials and nuclear activities within state do not contribute to the proliferation of nuclear weapons at all.

In the national level there are a lot of activities to be done. The State regulatory authority is needed. The national legal framework for safeguards implementation is needed. The regulations and procedures for the preparation and submission of State declarations to the IAEA, as well as enabling the IAEA inspection activities including the IAEA inspectors designation in the State need to be prepared.

The IAEA offers assistance to nuclear power newcomers under its seminars and training courses for representatives of State authorities and operators, and specific assistance such as the review of draft legislation and regulations. Good practices are also shared in the IAEA's new Safeguards Implementation Practices guides. But only the other States, with their practical experiences, are

able to share their view on IAEA safeguards implementation. That will complete the IAEA's effort to familiarize with the newcomers.

Finland has always been interested in proving the functionality of the key concepts and technologies in the area of nuclear non-proliferation safeguards. Since 1988 Finnish Support Programme to the IAEA safeguards (FINSP) has actively contributed in the areas of inspector training, safeguards technology development and conceptual planning. [1]

The Finnish work with the newcomers has been implemented as a FINSP tasks, in cooperation with the IAEA. In the training courses and workshops for newcomers, the roles and responsibilities between the regulator and operator have been described. It is important to have a regulators and operators with their own roles, common legislation and infrastructure to show how the work has been done.

FINLAND HAS PRACTICAL EXPERIENCES TO SHARE!

Some old, some new and some blue

Nuclear energy has had an important role in electricity production in Finland since the beginning of the 1980s. In 2014, one third of electricity production was generated by nuclear power. Finland has four operating reactors: two VVER-440 reactors at Loviisa constructed in 1977-80 and operated by Fortum, and two boiling water reactors in Olkiluoto, constructed in 1978-80 and operated by Teollisuuden Voima.

The construction license for building Finland's fifth reactor, Olkiluoto-3, was granted by the Government in early 2005, and it is subsequent to a Decision in Principle ratified by Parliament. In 2010, two additional Decisions in Principle for two new reactor units were approved by Parliament. These are Hanhikivi-1 and Olkiluoto-4. Today, new nuclear power company Fennovoima has sent the license application to construct Hanhikivi-1 nuclear power plant to Pyhäjoki, North part of Finland. In June 2015 TVO shareholders resolved not to proceed with plans for Olkiluoto-4. [2]

In addition, nuclear waste management and the disposal of spent nuclear fuel are progressing according to long-term plans. A site for the spent fuel disposal facility has been approved by a Decision in Principle by the Government in 2001. The construction license application for the spent fuel encapsulation and disposal facility was submitted by the nuclear waste company Posiva to the Ministry of Employment and the Economy in December 2012. In February 2015 Radiation and Nuclear Safety Authority, STUK, gave a statement which is based on the safety review and assessment. STUK's safety assessment is required for the decision on construction license that the Ministry of Employment and the Economy will prepare and the Government will make. The license was granted in November 2015. Before the actual commencement of final disposal operations for spent nuclear fuel, an operating license from the Government is required for the encapsulation plant and final disposal facility. Posiva is expected to apply for the license in 2020, and the operation of the facility is planned to start few years later. [3]

So, in Finland we have reactors in operation since 1970's, new reactors under constructing and licensing and the first in the world final repository for the spent fuel under construction. Also, we have a FiR research reactor from late 1960's and it will be the first reactor in Finland under decommissioning soon.

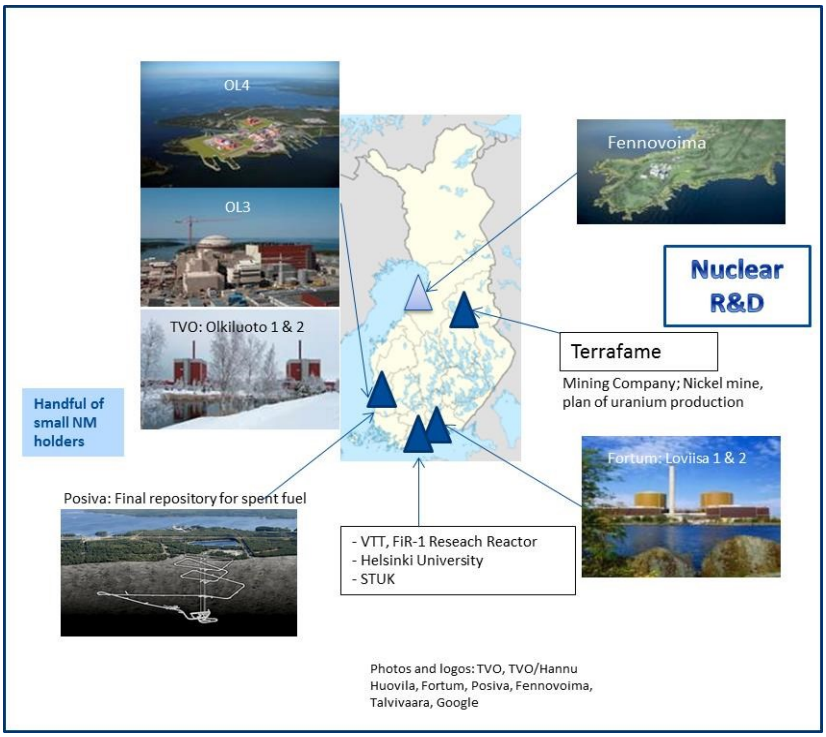

Figure 1: The Finnish fuel cycle: four operating nuclear reactors, one reactor under construction, one reactor under licensing, the first final repository and its encapsulation plant under construction, a research reactor under decommissioning and also plans of uranium production as a by product of nickel.

Finland has a long tradition in the peaceful use of nuclear energy. In the Paris Peace Treaty 1947 Finland declared to have only peaceful use of nuclear energy. The joining to the IAEA in 1958 and signing the Non-Proliferation Treaty (NPT) in 1970 among the first ones was natural. Finland was the first country which negotiated and signed comprehensive Safeguards Agreement with the IAEA in 1971 (INFCIRC/155) [4]. As a result, this agreement provided a basis for the finalization of the model for other non-nuclear weapon states. The model describing IAEA safeguards system is published as INFCIRC/153.

ABOUT THE ROLES WITHIN SSAC

Role of Regulatory Authority

Establishing national system

To fulfill obligations of international treaties it is necessary to establish state system of accounting for and control of (SSAC) the nuclear materials. It is States duty to create necessary legal background to take care that international and national objectives, for example measures for preventing of proliferation of nuclear weapons, conditions for licensing and safe and secure use of nuclear energy.

In the national legislation, the state system can be set and roles described. For example, in Finland export control is under the supervision of Ministry for Foreign Affairs, while supreme command and preparation of national nuclear legislation and licenses for nuclear facilities is under the Ministry of Employment and the Economy. The oversight of safe use is under the state regulatory authority STUK. This oversight includes supervision of safety, security and

safeguards. State regulatory authority is ensuring that operators are fulfilling all their duties in accordance with international treaties and legislation.

Establishing, development and maintaining of the state regulatory authority
It is important to ensure the independence of the regulatory authority. This means that even though the licenses are granted by the Government from the introduction of the Ministry of Employment and the Economy, the use of nuclear energy is prohibited if it is not approved also by the STUK. It is STUKs task to ensure that use is safe and it fulfils all safety, security and safeguards requirements. And vice versa, i.e. even if STUK would consider use to be safe, but it is not overall benefit of the interest of society, the parliament may prohibit the application in their hearing in the national decision of the principle phase.

Key role in establishing the SSAC is in the state regulatory authority, which state shall establish. regulatory authority is focal point which shall develop and maintain the SSAC and be contact point for the IAEA. In this context, it is important that regulatory authority widely co-operates and contributes to the implementation of the IAEA safeguards, for example by participating to the all IAEA inspections in the state.

State regulatory authority requirements for safe use of nuclear energy and materials
It is regulatory authority's task to prepare specific requirements for the operators necessary for supervision that international and national obligations and objectives are met. This work begins with identification of necessary steps for the use of nuclear energy and nuclear materials. First the detailed requirements for licensing and for the licensing conditions are necessary to form the basis. These requirements shall include management system, organizational and qualitative requirements for the operators. The safe operation presumes that there are set detailed requirements for safety, security and safeguards too. Safety includes largest scope of detailed requirements for systems, devices and equipment in all kind of expected use conditions including emergency situations. Security includes not only physical protection but also information security requirements to prevent all kind of planned and unplanned illegal actions. Safeguards includes accountancy and control requirements for nuclear materials and nuclear dual-use items, reporting requirements and enabling of the implementation of IAEA safeguards. In Finland, these detailed requirements are set in STUK's orders and regulatory guides issued by STUK.

Role of operator

Establishing the safeguards system and building a new nuclear facility
Safeguards of nuclear facility starts well before any nuclear fuel is introduced into the site. The control of dual-use items and technology must be already in action prior to the start of the construction. The methods of control of nuclear materials must be agreed with the authorities during the construction at the latest. So, the needs of safeguards in the facility layout and systems can be taken into account in the design process. Especially, the locations and coverage of safeguards surveillance cameras and seals should be decided as early as possible. At the side of this process the operator must prepare its own safeguards accountancy and reporting system. For this the operator needs input from the national authority, who must prepare national regulations to relay the IAEA requirements to the operator level.

Meaning of the import and export control
Normally, the control of nuclear materials, equipment and technology is focused on the control of their export. In Finland case, also the import of these materials and items is controlled and requires licenses granted by the regulatory authority. For the operator this causes some extra

effort and requires more detailed supervision of incoming material flow. At the same time, there is a higher chance that all the dual-use items are included into the operator's accountancy, when they arrive to the site. As a result, if some of these items must be exported back to the manufacturer or someplace else, it is easier for the operator to follow export control laws. Import control is not required by Nuclear Suppliers Group (NSG) guidelines or it is not a fundamental basis of international trade of dual-use items as the export control is. Still, the stricter import control supports later export control. It also provides a basis for the operator and the regulatory authority to understand what kind of nuclear materials, equipment and technology the state possess.

Safeguards organization

When establishing the system for the control of nuclear materials one of the key elements is the organization responsible for it. It's vital for the system that the operator has appointed responsible persons for safeguards and nuclear material accountancy. The experience has shown that it's the most beneficial to appoint persons who have technical background and at least a good general understanding of nuclear engineering, nuclear materials and operating of nuclear power plant. Beside this, the responsible persons need comprehension of international agreements and national laws. If persons are not part of the organization responsible handling of nuclear materials e.g. nuclear fuel or reactor core, they should be working in tight cooperation with it at least. This way the responsible persons for safeguards have the most recent information of the nuclear material balance and activities that have an effect to it.

Persons responsible for safeguards should also have good connections to persons responsible for safety and security. The same source of information can often be used for purposes of all three areas. Success of one of these areas supports the aims of the others. For example the well executed security prevents unauthorised access to the nuclear materials, equipment and technology. Even though these areas have their own responsible persons it's beneficial to have persons who oversee all these three areas.

Relations between operator and regulatory authority

Relations between the operators and regulator have a major impact on the successful of the SSACs. Open conversation helps to improve the system and methods of the control. This way both parties are able to benefit from expertise of each other's and ensure that the system is based on the best possible practises. For example when the national authority is preparing national regulations it can also use the expertise of the operator and let it to participate by commenting the draft versions. This way the operator is able take requirements in account already in the design phase and ensure that it can fulfil them all. This way the operator won't face impossible requirements that it won't be able to fulfil, because of some limitations in its accountancy system or some other reason. Still, there must be a clear distinction between the roles of the authority and the operator. The first sets the regulations and the former do its best to fulfil them.

Operator-IAEA relationship

The national authority usually takes care of the relations towards IAEA and the operator is faced with IAEA only during safeguards inspections. However, the operators usually have the best knowledge of their site, so especially during the foundation phase of the SSAC, the operators experience and understanding is vital, when forming the future safeguards methods for once country. Also, later during safeguards inspections and whenever discussions between the state and IAEA require expert knowledge concerning the site, the operator's contribution is crucial.

THE ROLES OF THE IAEA, MEMBER STATES AND SAFEGUARDS SUPPORT PROGRAMMES

Member States Support Programmes to the IAEA Safeguards (MSSPs) provide monetary and in kind support for the IAEA safeguards technical R&D, concepts development, training and practical safeguards implementation. Finnish Support Programme (FINSP) has initiated the task to provide support to the interface of the IAEA and newcomer state. The aim is to facilitate the initiation of safeguards implementation in the newcomer state. This is important for the IAEA, since the number of facilities and the states under safeguards measures are increasing, but the budget of the IAEA is stagnating.

The IAEA can not act as a consultant, when a newcomer state is setting up and initiating its SSAC activities. The role of the IAEA is quite delicate. The IAEA is an international civil servant who can not dictate and order in detail regulations how safeguards shall be implemented in a state. Safeguards is cooperation. But on the other hand the IAEA is counter player of a state, responsible to its Member States to provide credible conclusions that the state is fulfilling its safeguards obligations. Member states do not have these limitations. They can share their experiences freely and provide information about the best practices with the others.

MULTILATERAL AND BILATERAL INTERNATIONAL COOPERATION

There are lots of good experiences about multilateral and bilateral cooperation of the IAEA member states. IAEA organizes workshops together with experts from the member states. International conferences are especially useful for the new SSACs. INMM and ESARDA are good forums to share the experiences and best practices. MSSP is also a mechanism, which do not only provide necessary support to the IAEA but, as a side effect, also brings benefits to the international cooperation. The newcomer states should be encouraged to take part in to these activities, where appropriate.

Bilateral cooperation is sometimes the most efficient way to share experiences and expertise. This is especially the case, if the newcomer has found the practices and organizational structure of its bilateral partner as a model, from where the good practices can be learned from. But copying the practices blindly from another country never works. It all depends on the commitment of the Newcomer to develop its SSAC to meet its individual needs. In the course of history, EU has funded multiple of these kind of projects and STUK has participated a few of them. Another example is STUK's cooperation project with Kingdom of Saudi-Arabia. STUK provides consultancy support to the KSA, so they can set up their regulatory authority. One of the task orders dealt with the Safeguards and Security.

When a newcomer state has successfully established its SSAC the work is not yet done. The principle of constant improvement should also be applied here as well. There is always room for development and peer support from and cooperation with other SSAC's can be of important help. One example could be developing independent verification and laboratory capability. Shifting from one type of safeguards agreement to another like through signing and ratifying Additional Protocol of Comprehensive Safeguards Agreement is always point in time where peer support is useful.

Figure 2. Safeguards training for a newcomer state in Finland. The aim of the training was to give the participants the knowledge to manage a safeguards inspections. Therefore, there was demonstrated how an inspection is done in practice and what is required from the operator.

MENTORING – EXPERIENCED ONES TALK TO NEW ONES

After safeguards implementation practices guides were published, it was soon noticed that there is a definite need for the informal meetings between experienced and inexperienced persons dealing with the safeguards issues. These are not only to introduce necessary safeguards measures but for example also to proactive discuss about expected occasions and incidents. Of course there are not only one right answer to solve all the problems but there are many ways how to take care that these problems can be solved. And when one is discussing about the issues concerning implementation of the safeguards in accordance with the treaties and safeguards agreements, he can prepare to foreseeable problems. No one is expert by the birth. Every country is different, so there certainly are different ways to move forward. When one can have place and opportunity to discuss with more experienced persons, it is always a place to bring in fresh ideas and to challenge the old ones. So, mentoring and bilateral support is encouraged always, and when there is possibility to take part to the meetings where there are more countries involved, one can learn more and teach others too.

One way to support newcomers is to offer possibility to study and learn by doing possibility. In Finland, STUK have offered training in the form of on the job learning to the safeguards authorities from all over the world. The main idea have been that these trainees are working by their own with their own tasks and the STUKs experts are keeping the “private” lessons and

sessions for them about all the safeguards relevant matters. On the final day, the trainees have kept final presentation about their experiences and how these experiences can be applying in his country.

3S WORKSHOPS FOR NEWCOMER STATES

FINSP has organized together with IAEA two 3S workshops oriented to the Newcomer states in 2012 and 2014. IAEA made the selection to which countries the workshop was open. The participants were mainly either from the operator or from the regulator. The purpose of these one week training courses was to provide perspectives from experts on the roles of regulator and operator in defining and implementing national requirements for the management and operation of a nuclear power plant, including operating requirements for safety, security, nuclear material handling, waste management public communications and emergency response. In particular, the training course sought to provide guidance on:

- Defining the operating license requirements (Regulator)
- Defining the operating plan to demonstrate full compliance with operating requirements (Operator)
- Regulatory inspections
- Interfaces between disciplines to ensure effective operations and to maximize resources

The workshops in 2012 and 2014 were largely based on the experience that the Finnish regulator and operators have. In the workshops, comprehensive view on what is required to run a successful nuclear energy program was created by practical examples and exercises. One part of the courses was a visit to a nuclear power plant site in Finland. The participants also prepared a concise country presentation for others. The visit to NPP and waste management facilities show to the participants what it in practice means to operate a nuclear power plant and what kind of daily actions it requires. The participants were given a list assignments to conduct during the visit as an exercise. After the visit, a Lessons Learned wrap-up session was organised, where the findings were discussed.

Building on the success of the first two events, third workshop is scheduled to take place in early 2017 in the UAE. The event will be organized by the IAEA and UAE regulator. Finnish experts will participate the planning and execution of the workshop. The event will provide additional guidance on the development of an effective regulator-operator interface that is necessary to implement the national requirements for a nuclear power programme, specifically in the areas of safety, security and nonproliferation.

IAEA SAFEGUARDS IMPLEMENTATION GUIDES AND THEIR OUTREACH EVENTS

Under the years 2013-2015 IAEA has created a set of guidance to its Member States with the help of MSSPs. These guidance documents are useful especially for Newcomer States when setting up their SSAC activities. FINSP has been active in contributing two documents: Guide on facilitating IAEA Verification Activities [5] and Establishing and Maintaining State Safeguards Infrastructure [6].

In order to facilitate their implementation in the Member States, the IAEA has organised Outreach Events in Vienna. Two Events have been organised in 2016 February and April. FINSP also contributed to these events by preparing and providing the lectures and facilitating the exercises. The first outreach event in February 2016 on the guide “Establishing and Maintaining

State Safeguards Infrastructure" reached 26 experts from Newcomer States, thanks to the sponsoring by UN and Japanese Support Programme. The workshop got a very positive feedback. This kind of practical training is wanted a lot more.

The purpose of the another workshop in Apr 2015 was to use SIP Guide "Facilitating IAEA Verification Activities" as a vehicle for sharing the guidance and good practise in safeguards implementation. For this event no sponsor was available to cover the travel costs of the participants, which limited the possibilities for the Newcomer States to attend the event.

Figure 3. Participants of the second 3S workshop in 2014. The participants were from Viet Nam, United Arab Emirates, Turkey, Nigeria, Malesia, Jordan and Bangladesh.

CONCLUSION

IAEA has been actively supporting the States pursuing Nuclear Power to develop and enhance their SSACs in many ways: organizing workshops, preparing guidance and facilitating international cooperation. However, the Member States benefit also cooperation with and support from other Member States in order to set up a fully functional SSAC and operator-regulator framework. Finland has relative experience in this regard and she has cooperated with the IAEA through FINSP and through other forms of international cooperation and expert services. To keep the use of nuclear energy in line with the overall good of society, and in particular to ensure that the use of nuclear energy is safe for man and the environment and does not promote the proliferation of nuclear weapons is the national objective in Finland. To contribute to this also internationally is totally in a line of this objective.

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