

## The Swiss regulator's research strategy and its links to competent and independent expertise

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**Abstract.** The Swiss regulator ENSI is aware of the fact that a number of elements contribute to useful internal competence and external expertise. One factor is ENSI's research programme managed by means of an annually updated research plan covering the four successive years each. For this purpose, ENSI's new research strategy provides general objectives and related criteria applied to all research projects and possible future research topics systematically, taking into account several aspects of competence and independence of expertise. On the one hand, these aspects comprise the usability of the expected results for specific supervisory work, creating the basis for external expert assessment and techniques, but also increasing the competence of ENSI's internal experts attending the research projects. On the other hand, these aspects are related to the impact on independence of future expertise, to education (predominantly masters' dissertations and doctoral theses), and to the international integration of ENSI and its experts into specialist networks. As a result, the research plan provides a comprehensive overview, enabling ENSI to prioritise research in a manner that covers strategic aspects like expertise by anticipating future supervisory needs.

### 1. ENSI and its research programme

The Swiss Federal Nuclear Safety Inspectorate ENSI is the national regulatory body for the nuclear safety and security of Swiss nuclear facilities. ENSI's supervision encompasses five power reactors, research facilities, transports of nuclear materials, an interim storage facility for radioactive waste and the investigations to identify a suitable location for the deep geological disposal of radioactive waste. Though being a relatively small regulator, ENSI's technical sections address the whole range of safety aspects relevant for its duties, striving for keeping internal competence at the highest level possible. However, ENSI's capacities of course do not allow it to execute all necessary work on its own. In particular for highly specialised tasks ENSI relies on external experts.

In order to carry out its supervisory activities in a professional manner, ENSI must keep abreast of the latest developments in science and technology. For this purpose, ENSI is entitled to undertake research itself and to support nuclear safety research projects [1]. In addition, the results of research provide a basis for its decisions [2]. For this purpose and in accordance with the Swiss legal framework, research and development must fall within the scope of ENSI's remit, i.e. it must relate to safety and security issues [3]. Based on these legal obligations, ENSI maintains its "Regulatory Safety Research" programme comprising about 35-40 projects and a budget of approximately 6 million Swiss francs per year (equivalent to some 6.5 million US-\$). ENSI publishes the results of its regulatory safety research in its annual Research and Experience Report [4].

may undertake research itself, and it may also support nuclear safety research projects<sup>12</sup>. In addition, the results of research provide the basis for its decisions<sup>13</sup>.

The research projects undertaken or supported by ENSI fall primarily within the category of applied research. These projects may also include development work which draws on available knowledge (such as experimental results) but which delivers essentially new findings, as opposed to the mere routine application of knowledge already acquired for the purpose of services (consultations, expert reports, routine measurements, training, etc.)<sup>14</sup>. Basic research devoid of aspects that can be utilised for supervisory activities does not fall within the category of regulatory safety research.

Research and development work can be billed only if it falls within the scope of ENSI's remit, i.e. it must relate to safety and security issues<sup>15</sup>. ENSI collects fees from the owners of nuclear plants, nuclear goods and radioactive waste for research and development work undertaken or arranged for individual nuclear plants in the course of its supervisory activities<sup>16</sup>. The Federal government also pays a contribution which is used to finance additional applied safety research<sup>17</sup>. Moreover, in order to cover the costs of supervisory activities that cannot be allocated to specific nuclear plants, ENSI collects an annual supervisory levy from the proprietors of nuclear plants<sup>18</sup>; this can also be used to pay the costs of research and development work undertaken at ENSI's behest.

ENSI endeavours to ensure that the Federal government finances an appropriate proportion of regulatory safety research.

## 2 Objectives

ENSI undertakes and supports projects under the auspices of its "Regulatory Safety Research" programme. In so doing, ENSI pursues the following objectives in particular:

1. **Investigation of open issues:** Questions regarding the safety of nuclear plants that are as yet unresolved arise not only from ongoing supervisory activities, but also in the course of the general development of science and technology. Research projects should make it possible to identify potential problem areas, to develop potential improvements, to reduce uncertainties and to improve processes. In these ways, such projects should play their part in maintaining and enhancing the safety of Switzerland's nuclear plants. In order to identify these issues, ENSI takes account – first and foremost – of

<sup>12</sup> as per Art. 2, paragraph 3 of the ENSI Act (ENSIG) and the Dispatch regarding the ENSIG.

<sup>13</sup> as per the ENSI Management Manual, "Basics of Supervision" process (HPB0140).

<sup>14</sup> on the basis of the Policy Paper on Research and Development at Universities of Applied Sciences,

Rectors' Conference of the Swiss Universities of Applied Sciences (KFH) (2008).

<sup>15</sup> as per Section 8.8.1 of the Dispatch regarding the NEA.

<sup>16</sup> as per Art. 83, paragraph 1, NEA.

<sup>17</sup> on the basis of Art. 86, paragraph 1, NEA; the funds are transferred to ENSI by the Swiss Federal Office of Energy (SFOE).

<sup>18</sup> as per Art. 83, paragraph 2, NEA.

developments in international bodies, the results of ongoing research projects and specialists' conferences; it also considers recommendations from other Federal institutions, especially those from the Federal Nuclear Safety Commission (NSC/KNS)<sup>19</sup>. In addition, ENSI takes part in research projects of the Federal Working Group on Nuclear Waste Disposal (AGNEB). Specifically, moreover, it aims to close gaps in knowledge which are not covered by the research programmes of the supervised entities.

2. **Practical support for supervisory activities:** Research projects should deliver or continue to develop basic principles and aids which ENSI requires in order to carry out its tasks, e.g. for the purpose of drawing up ENSI guidelines and arriving at specific decisions. Examples of such aids include simulation programmes for safety analyses and investigative methods for inspections.
3. **Maintaining and expanding expertise:** Research projects should help to maintain and expand ENSI's expertise and (as a secondary aim) that of ENSI's own specialists. Research projects carried out in Switzerland are advantageous for this purpose, especially if they include training.
4. **Promotion of independent expertise:** Research projects, especially those which entail practical support for supervisory activities, can (to some extent) create the basis for expert reporting and for the operational monitoring of nuclear plants. In specialised areas where ENSI calls on external experts, research projects should help to develop independent expertise that will prevent potential conflicts of interest<sup>20</sup>. For this purpose, and in order to encourage diversity, ENSI aims to base its research on different institutions.
5. **Promotion of international interchange:** A substantial proportion of international interchange at specialist level takes place in committees and similar bodies which control research and assess its results. This applies in particular to the bodies of the Nuclear Energy Agency (NEA) within the Organisation for Economic Co-operation and Development (OECD). Moreover, many research projects can only achieve helpful results with the help of contributions from multiple countries. Regulatory safety research should foster the international integration of ENSI into specialist networks.
6. **Enhancing ENSI's attractiveness:** Providing follow-through for research projects involves varied activities aimed at acquiring new knowledge; this work should make ENSI more attractive to new employees, especially younger and highly qualified individuals.

<sup>19</sup> as per Art. 2 of the Ordinance regarding the Federal Nuclear Safety Commission (NSCO/KNS).

<sup>20</sup> cf. also the IAEA General Safety Guide GSG-4 (2013): Use of External Experts by the Regulatory Body.

FIG. 1: ENSI's general objectives for its research programme [5].

In June 2013 the ENSI Board, ENSI's strategic and internal supervisory body, approved a new research strategy [5], defining six general objectives for its research programme (FIG. 1) Based on the objectives, the research strategy specifies seven criteria according to which ENSI assesses support for proposed research projects (FIG. 2). Several of the objectives and the related criteria directly or indirectly refer to the competence and independence of expertise ENSI needs to fulfil its duties. The present paper is dedicated to illustrating these relations.

## 2. Maintaining and enhancing skills

An obvious link to competence is provided by objective No. 3, stating that research projects should help to maintain and expand ENSI's expertise and (as a secondary aim) that of ENSI's external specialists. This objective is achieved by two measures:

- Firstly, every research project which is not managed by ENSI itself is followed by (at least) one individual from the relevant section in ENSI. This ENSI project attendant monitors the project and ensures that the knowledge gained therefrom is incorporated into ENSI's ongoing supervisory activities. Due to this fact, there is no section dedicated only to research, instead a research coordinator covers the overarching aspects. This illustrates that ENSI pursues the strategy to maintain as much internal competence as reasonably achievable by a regulator with about 150 employees.

- Secondly, ENSI is committed to promote training with the means dedicated to research [6]. Specific training (especially masters' dissertations and doctoral theses) carried out by the research project constitute a criterion for assessing research projects. Research institutions benefit from that as well as licensees and the regulator, when recruiting staff educated by research institutions.

### 3 Criteria

In accordance with its legal basis and overall objectives, ENSI assesses support for proposed research projects according to the following specific criteria:

1. **Technical and qualitative aspects**, in particular:
  - a. Specialist / scientific requirement for the project in order to improve the safety of Swiss nuclear plants on the basis of the existing level of knowledge; also, avoidance of undesirable overlaps with ongoing or completed projects.
  - b. Expected quality of the work on the basis of the application, publications and other proven achievements, also (where appropriate) on the basis of ENSI's past experience with the applicants. This includes technical aspects as well as formal criteria such as compliance with deadlines and reporting.
2. **Relevance to supervisory activities**: Utilisation of the project results for specific supervisory work by ENSI which is scheduled in the foreseeable future or is already in progress. Examples include contributions towards drawing up guidelines and specific decisions by ENSI, as well as the development or improvement of aids (such as simulation programmes or investigative methods) that are used by ENSI. This point is especially important for assigning priorities to projects.
3. **Maintaining and expanding expertise**: Specific training/educational measures (especially the completion of degree or masters' dissertations and doctoral theses) constitute a key criterion for prioritising research projects. If projects are equivalent in other respects, ENSI gives preference to those which entail training or education in Switzerland.
4. **Impact on future recruitment of experts**: Project applications are reviewed to determine whether ENSI could commission the applicants to draw up expert reports on nuclear plants in the future. Experts must meet the following specific criteria<sup>21</sup>:
  - a. They must not work in an area of an organisation which is subject to supervision by ENSI.
  - b. The assignment must not relate to any parts or systems of a nuclear plant, or to related evidence of safety (in whole or in part) which the expert planned or constructed, or on which he/she reported, on behalf of the supervised party.

For these reasons, ENSI gives preference to research projects by institutions whose employees are unlikely to be involved in conflicts of interest in the relevant specialist area if they undertake potential expert work for ENSI at a later stage.

5. **Promotion of ENSI's integration into international networks**: This aspect relates in particular to projects with participation by organisations from various countries, which can therefore deliver results that could not be obtained in Switzerland alone. Examples include comparative calculations by various groups of research institutions or supervisory authorities (known as benchmarks) and the systematic identification and analysis of infrequent types of damage and events in nuclear plants.
6. **Demarcation from remit of supervised parties**: Research supported by ENSI must not comprise substantial parts of the supervised parties' own duties. Within international projects which also involve representatives of operators or manufacturers of nuclear plants, ENSI advocates the priority of safety aspects and/or support for supervisory activities.
7. **Risk analysis**: In case of foreseeable problems, especially if difficulties have already arisen in connection with comparable projects in the past, the applicants must carry out a risk analysis. Examples include difficulties with the international transport of radioactive samples, or problems with staff recruitment. Applicants must clearly show how they will avoid (or, if necessary, resolve) problems of this sort.

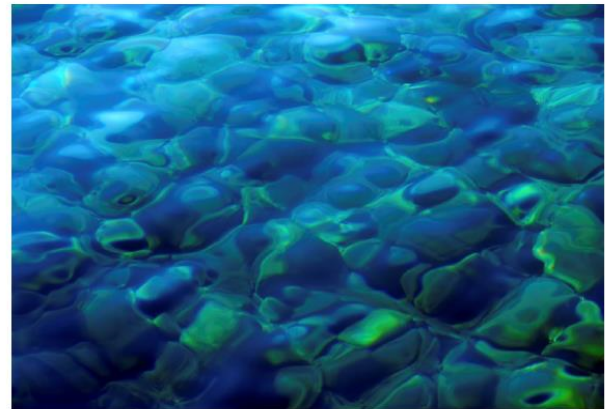


FIG. 2: ENSI's criteria for assessing support for proposed research projects [5].

When it comes to the skills of ENSI's employees, objective No. 2 of the research strategy additionally comes into play. Research projects should deliver or continue to develop basic principles and aids which ENSI requires in order to carry out its tasks, e.g. for the purpose of drawing up ENSI guidelines and arriving at specific decisions. For this purpose, the corresponding criterion No. 2 requires that research projects should aim at gaining results which can be used by ENSI for specific supervisory work scheduled in the foreseeable future or already in progress. Consequently, the researchers working on these issues acquire skills that they may also use when working for the regulator ENSI at a later point in time, thereby improving their job opportunities at the same time.

### 3. Independent expertise

Objective No. 4 of the research strategy relates to the future impact of research on promotion of independent expertise. Research projects, especially those entailing practical support for supervisory activities, can, at least to some extent, create the basis for expert assessment and for the operational monitoring of nuclear installations. In specific areas where ENSI calls on external experts, research projects should help to develop independent expertise that will prevent potential conflicts of interest. Such an approach is in line with the provisions of the IAEA General Safety Guide GSG-4 [7].

According to the respective criterion No. 4 of the research strategy, project applications are reviewed to determine whether ENSI could commission the applicants with drawing up expert assessments on safety issues of nuclear plants in the future. Persons acting as external experts for ENSI must meet the following criteria [8]:

- They must not work in a sector of an organisation which is subject to supervision by ENSI.
- The work carried out for ENSI must not relate to any parts or systems of a nuclear plant, or to a related safety demonstration (in whole or in part) which the expert planned or designed, or on which he/she reported, on behalf of a supervised party.

For these reasons, ENSI gives preference to research projects of institutions whose employees are unlikely to be involved in conflicts of interest in the relevant specialist area if they will potentially undertake expert work for ENSI at a later stage. ENSI's service contracts with experts comprise special provisions where appropriate. Depending on (potential) other work carried out for licensees, experts may be obligated to inform ENSI in advance about new contracts envisaged with licensees or even to ask ENSI for approval of such contracts.

In addition ENSI follows a strategic approach to encourage diversity which also contributes to independent expertise. Therefore ENSI aims to base its research on different institutions. ENSI is interested in obtaining the best proposals for its research. Consequently, ENSI set up a form on its website enabling the submission of proposals for research projects for any interested party [9].

### 4. International networking and attractiveness for employees

Furthermore regulatory safety research should foster ENSI's international integration into specialist networks (objective No. 5 of the research strategy). This is achieved by international research projects like benchmarks in which ENSI and/or its external experts participate. ENSI's oversight activities benefit substantially from such projects, since they allow to compare and to improve not only the methods used (codes etc.), but also the capabilities of the experts, be they internal or external.

Last but not least, acquiring new knowledge by following research projects, being a key function for ENSI specialists, increases ENSI's attractiveness for new employees, especially to younger and highly qualified individuals (objective No. 6 of the research strategy). This contributes to ENSI's own competence on the longer term.

### 5. Coordinating the research programme

The principal purpose of ENSI's research strategy is to provide general objectives and the criteria for research projects. Regarding the thematic orientation, the research strategy merely indicates several subject areas ENSI's (new) research activities are likely to focus on in the coming years. This is due to the fact that the research strategy should be maintained for a number of years.



The more detailed planning covering the next four years is left to a research plan adopted by ENSI's executive management (FIG. 3). In terms of continuous planning, the research plan is updated annually. This avoids that strategic aspects are only discussed in connection with specific proposals for new research projects or the extension of existing ones. Instead all existing projects and possible new research topics are reviewed systematically once a year according to the criteria of the research strategy, thus enabling ENSI to prioritise individual research projects and to include strategic aspects like future expertise based on a comprehensive picture.

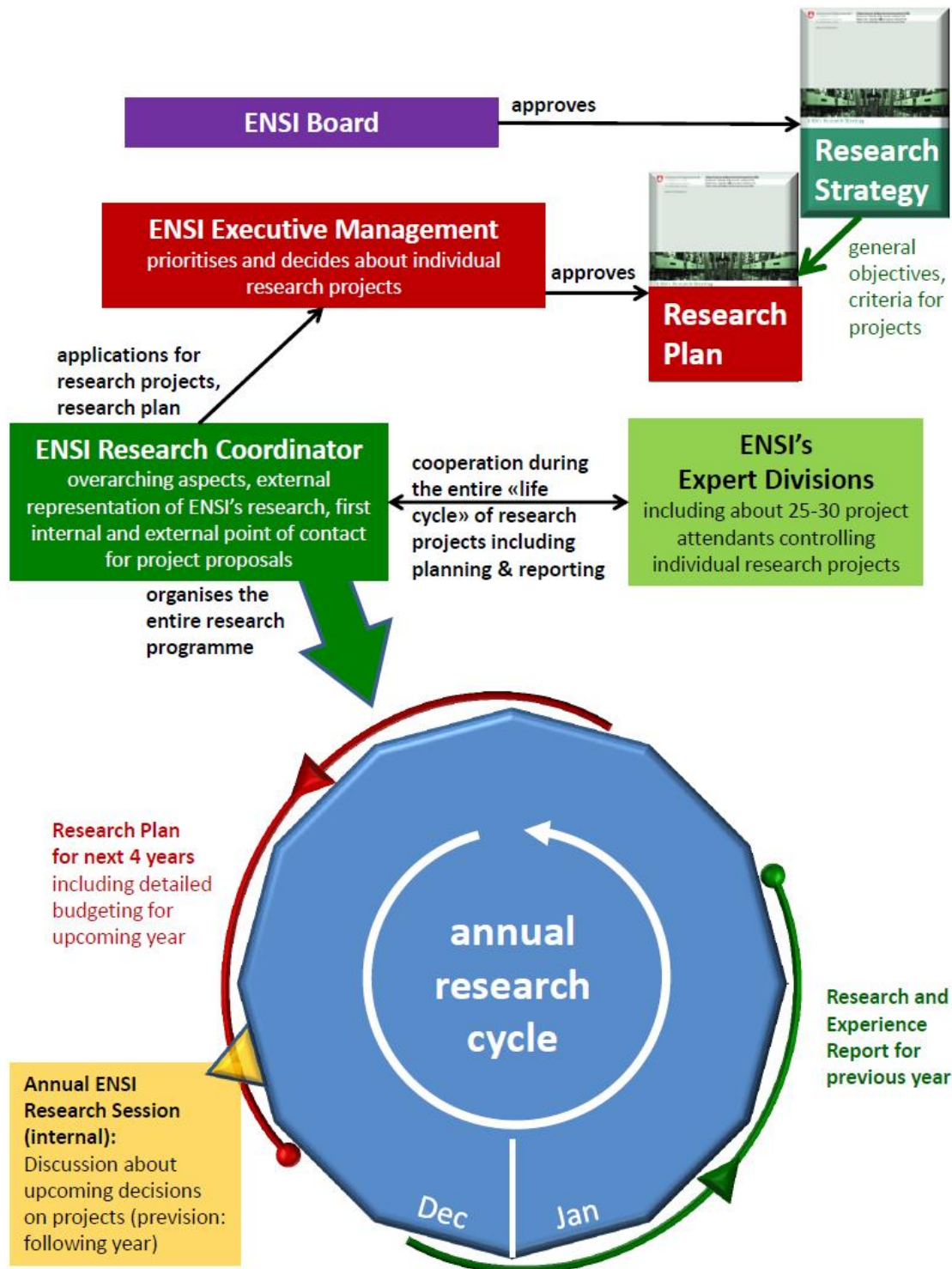


FIG. 3: Diagram illustrating how ENSI's research programme is managed. Source: ENSI.

## 6. Conclusions

Competent and independent expertise, being a crucial prerequisite for the regulator's function, cannot be achieved by the regulator solely, and it cannot be attained by single measures in the research programme. But the regulator's research programme can have a significant impact, especially by anticipating future supervisory needs. ENSI's research strategy pays tribute to this fact by systematically taking into account a variety of factors influencing the competence and independence of experts.

## 7. References

- [1] Art. 2, paragraph 3, of the ENSI Act (ENSIG) and the Dispatch regarding the ENSIG.
- [2] ENSI Management System, "Basics of Supervision" process (HPB0140).
- [3] Section 8.8.1 of the Dispatch regarding the Nuclear Energy Act NEA.
- [4] ENSI's annual Research and Experience Reports are available on ENSI's website via the web page "documents ► annual reports": <http://www.ensi.ch/en/document-category/erfahrungs-und-forschungsberichte/>.
- [5] ENSI's Research Strategy. Swiss Federal Nuclear Safety Inspectorate ENSI, June 2013. Available in English, German and French on ENSI's website: <http://www.ensi.ch/en/document/ensis-research-strategy/>.
- [6] Art. 77 of the Nuclear Energy Ordinance (NEO/KEV) and the Explanatory Report on the NEO (Art. 76).
- [7] IAEA General Safety Guide GSG-4 (2013): Use of External Experts by the Regulatory Body.
- [8] ENSI Management System, "Procurement" process (HPB0460).
- [9] The form for submitting proposals of research projects is available on ENSI's website via the web page "contacts": <http://www.ensi.ch/en/contact-us/> (also in German, French and Italian).