

DEVELOPING STRATEGIC PLANS FOR EFFECTIVE UTILIZATION OF RESEARCH REACTORS

D. RIDIKAS

*Department of Nuclear Sciences and Applications
International Atomic Energy Agency, Vienna International Centre, PO Box 100
1400 Vienna, Austria*

E-mail: d.ridikas@iaea.org

ABSTRACT

Strategic plans are indispensable documents for research reactors (RRs) to ensure their efficient, optimized and well managed utilization. A strategic plan provides a framework for increasing utilization, while helping to create a positive safety culture, a motivated staff, a clear understanding of real costs and a balanced budget. A strategic plan should be seen as an essential tool for a responsible manager of any RR, from the smallest critical facility to the largest reactor. In fact, not only is it a document that can provide justification for the operational funding required for the facility, but it is also a powerful means of management control for all activities relating to the facility. A well prepared strategic plan will also provide on-going benefits to the facility management. However, due to its evolutionary nature, a strategic plan is a dynamic process, and therefore the plan will require monitoring and regular update to be truly successful.

In conjunction with this year's planned revision of IAEA TECDOC-1212 on "Strategic Planning for RRs" (2001), and in order to reflect the current status and trends in RR utilization and management, a group of international experts has reviewed 37 strategic plans submitted by RR managers in 2013-2014. The resulting suggestions and recommendations were communicated to the originators for their consideration. Each strategic plan document was reviewed against the requirements of TECDOC-1212. Results were tabulated for each document individually and recommendations for improvement were communicated to the originators. The detailed review also indicated a scoring range from well-prepared strategic plans that required only a limited amount of attention and others which were notably insufficient in their preparation.

As a follow up to the review, two interregional workshops were organized in July 2013 and October 2014. They gave for the a great number of participating RR facility managers from close to 30 Member States the chance to share experiences, lessons learned and good practices in developing and implementing strategic plans at their facilities. The lively meetings, packed with experts' lectures, country presentations and round table discussions, resulted in tangible suggestions and recommendations regarding how strategic plans should be prepared, revised and implemented. The concrete examples and case studies also provided additional input to how the TECDOC-1212, presently under revision, needs to be improved.

This paper will present in detail the results and lessons learned from the IAEA efforts to help the RR facilities developing strategic plans for effective utilization, provide review and advise services, organize national and regional stakeholder/user workshops, prepare further guidance and recommendations, document and publish guidance documents and other supporting materials.

1. Introduction

The IAEA is convinced of the need for Research Reactors (RRs) to have strategic plans (SPs) for their utilization and has regularly issued a series of publications to encourage facility managers, operators and stakeholders in this regard. The first publication of “Strategic Planning for Research Reactors” was released as TECDOC-1212 in 2001 [1]. In the meantime, planning the utilization and administration of RRs has changed according to how new technologies, business strategies and organizational structures have developed.

The IAEA has also sponsored several meetings and workshops to facilitate the exchange of expert advice and local circumstances in order to improve the concept of research reactor strategic plans and their implementation. The outcomes of these meetings identified the need to revise the original TECDOC-1212 and to publish a new version that will provide an improved approach to assist both existing and new research reactor operating organizations. Such an approach would enable reactor management to determine more accurately the state of existing reactors or the intended operation of new facilities. At the same time, management could identify the capabilities of their research reactors and match these to stakeholders’ needs and establish the feasibility of supplying such needs. Management could then also establish a long term vision that would not only accomplish optimized utilization of the research reactor but would also promote the sustainability of the reactor and its ancillary facilities.

The review of the original TECDOC-1212 was also strongly recommended by the Technical Working Group on Research Reactors (TWGRR). Although the original TECDOC-1212 only focused on enhancing the utilization of existing RRs, this updated version now also provides guidance on how to develop a strategic plan for a new RR and will be of particular interest for organizations which are preparing a feasibility study to establish such a new facility. This revised publication, therefore, now complements the recently published RR Milestones document [2] and contributes to the important set of technical documents and guidelines recommended for new RR facilities. In addition, the concepts of the recently issued document on RR applications and utilization [3] are incorporated in this revision. The latter report brings together many of the current uses of RR and enables a reactor owner or operator to evaluate which applications might be possible with a particular research reactor facility. An analysis of a research reactor’s capabilities, both existing and potential, is an early phase in the strategic planning process.

This paper presents some major results and lessons learned from the IAEA efforts to help the RR facilities developing strategic plans for effective utilization, provide review and advise services, organize national and regional stakeholder/user workshops, prepare further guidance and recommendations, document and publish guidance documents and other supporting materials.

2. Review of SP documents

Assistance in preparation and review of SP documents is available as an IAEA service provided to the RR facilities. Indeed, SPs for RRs are key documents to ensure their efficient, optimized and well managed utilization - this applies to both existing and newcomer RRs. Newcomers benefit from a strategic plan by the justification of the project and by clarified definition of the specification of the RR and its ancillary facilities in order to optimize its future utilization. On the other hand, existing RR could benefit by re-evaluation of stakeholder needs in order to both continue operation and to optimally increase its utilization.

In conjunction with this year’s planned revision of TECDOC 1212 and in order to reflect the current status and trends in RR utilization and management, a group of international experts has reviewed 37 strategic plans submitted by RR managers around the world. The resulting suggestions and recommendations were communicated to the originators for their consideration. Each strategic plan document was reviewed against the requirements of TECDOC 1212. Results were tabulated for each document individually and recommendations for improvement were communicated to the originators. The detailed review also indicated a scoring range from well-prepared strategic plans that required only a limited amount of attention and others which were notably insufficient in their preparation.

In practice, the review of each individual SP document was completed according to a sufficiency scale (0 to 10) of section content according to the IAEA TECDOC-1212 proposals with the results tabulated for each SP. The outcome of this allocated review also indicated a range from “well-prepared SPs that required some attention with overall average, say, above 5” to some SPs which were “totally insufficient in their preparation with overall average, say, below 5”.

A selective ranking system based purely on average of un-weighted scores is given in Table 1 for comparison of the levels of SP sections-areas completed by the various facilities. The numbers are the granted points (from 0 to 10). Table 1 also includes specific country average for all required sections-areas (grey column), number of zeros for not included chapters-areas (bright-blue column) and section-area averaged score by all considered countries (last line).

Table 1: The levels of SP sections-areas completed by the various facilities

Required sections or areas	Exec Stat MS	Intro	Fin Disc	Capab (Exist)	Capab (Pot)	Stake-H (Exist)	Stake-H (Pot)	SWOT	Mission	Strat Consid	Struct & Pers	P Object	Sp Object	Action Pl	Stat & Rev	Market	Fin	Average	# of zeros
Country 1	9	10	10	8	9	8	10	10	10	10	9	8	10	7	10	0	10	8.71	1
Country 2	10	10	8	8	8	10	10	10	10	10	8	5	9	8	10	0	10	8.47	1
Country 3	9	10	8	7	4	7	6	7	10	8	7	9	6	7	8	0	10	7.24	1
...	0	9	10	10	8	5	5	9	7	10	9	8	9	1	10	0	10	7.06	2
	9	9	7	6	4	6	4	8	10	7	10	9	8	0	0	0	0	5.71	4
	9	10	8	10	10	9	7	10	10	0	6	0	0	0	0	0	0	5.24	7
	0	0	0	0	0	0	0	10	10	10	0	8	8	8	8	0	0	3.65	10
	0	0	7	6	6	6	6	7	7	0	0	6	6	0	0	0	0	3.35	8
	0	0	0	0	0	0	0	0	0	0	0	8	9	9	0	0	0	1.53	14
Average	5.1	6.4	6.4	6.1	5.4	5.7	5.3	7.9	8.2	6.1	5.4	6.8	7.2	4.4	5.1	0.0	4.4	Average	

The involved experts recommended that the IAEA provide suitable feedback to each individual facility regarding the level of the SP preparation to still receive attention before the forthcoming workshop and then to address any outstanding shortcomings at the workshop and assist the applicable RR managers to complete their SPs to the required levels of sufficiency.

From Fig. 1 one can clearly observe that “Marketing”, “Finances”, “Action plans” and “Potential stakeholder needs” are the areas where the most attention is required by all.

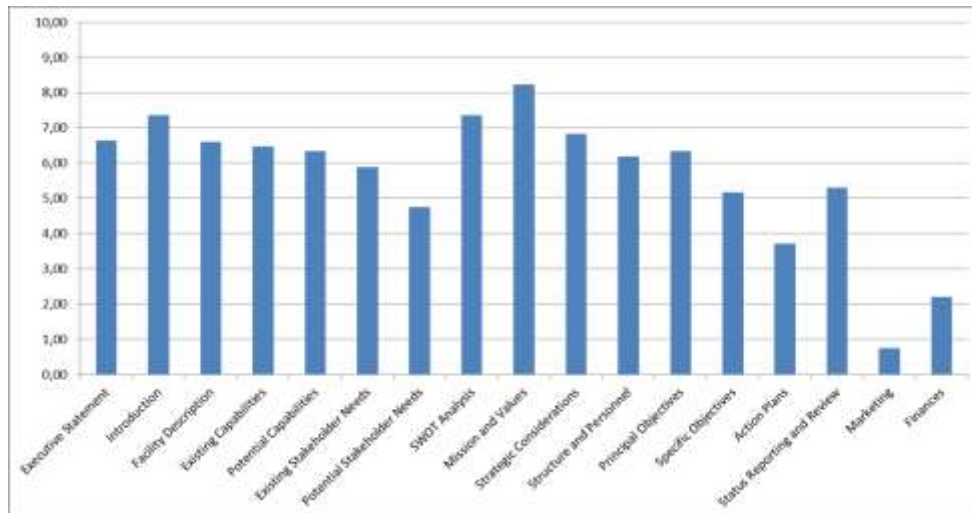


Figure 1: Un-weighted performance of SP sections-areas, averaged over all RR facilities which submitted their SP for review.

Other observations by the experts were:

- Most reports were submitted following the IAEA template – but
 - A few countries provided strategic plans in a different layout to that requested;
 - The general recommendation remains that these countries adapt their information to the IAEA TECDOC-1212 and provided format.
- Most countries completed several of the seventeen sections, but not all countries provided all information requested;
- Several countries referred to Annexes to their report but these were not received by the IAEA (and subsequently not made available to the reviewing experts);
- Although several SPs had been dated as prepared in 2012 or later, many of the others were outdated, some very much so and had obviously not received the necessary managerial controls to ensure implementation;
- Although several of the SPs reviewed applied the IAEA template there were very few that satisfactorily addressed all the review requirements of the performance indicators;
- The current status of the facility was generally well described in the SPs, as well as the analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) of the facility;
- Potential capabilities, strengths and opportunities on one hand and potential stakeholder needs are not always clearly correlated to one another;
- Quantitative information on existing capabilities and existing stakeholder needs is often absent;
- Operating schedules are missing, as are characteristics of facilities (e.g. neutron fluxes, maximum source strengths that can be handled), presence of auxiliary facilities such as hot cells or radioisotope processing plants;
- It is difficult to draw conclusions on existing stakeholders' needs if no information is given on, e.g. how often irradiations have to be provided, how many students are trained, how many samples are irradiated for NAA, etc.
- The principal objectives – and derived specific objectives - mostly are based on the strengths and opportunities. However, many facilities report concerns in their SPs how the existing experience can be fostered, or expanded, but such weaknesses or even threats are considered only in a few cases as a principal objective for actions;

- Both the specific objectives and derived action plans often contain sufficient detail, but the ones drafted using the Template’s tables demonstrate that they were drafted with attention to realization;
- It is at least remarkable that only one facility explained in detail their outreach and marketing strategy and actions. This component was not specifically addressed as a mandatory item in the IAEA Template;
- It is regrettable that facilities did not take the initiative of adding marketing strategy to their SPs. This, together with the fact that almost all facilities literally copied the IAEA template text for the executive management statement, i.e. without any facility-specific notes, may raise the question whether the SPs have been reviewed at the highest executive level.

3. Follow up workshops

As a follow up to the review process of the received SPs, two interregional workshops were organized in July 2013 and October 2014. Altogether, they gave for the a great number of participating RR facility managers from close to 30 Member States the chance to share experiences, lessons learned and good practices in developing and implementing strategic plans at their facilities (Fig. 2). The concrete examples and case studies also provided additional input to how the TECDOC-1212, presently under revision, needs to be improved.



Figure 2: Photo of participants and experts attending the IAEA Training Workshop on “Development of Research Reactor User Communities and Industrial Partnerships” IAEA Headquarters, Vienna, Austria, 13–17 October 2014.

The workshops also allowed facilitating the exchange of experts’ advice and local circumstances in order to improve the concept of RR strategic plans and their implementation. Such an approach enables reactor management to determine more accurately the state of existing RRs or the intended operation of new facilities. At the same time, management could identify the capabilities of their RRs and match these to stakeholders’ needs and establish the feasibility of supplying such needs. Management could then also establish a long term vision that would not only accomplish optimized utilization of the RR but would also promote the sustainability of the reactor and its ancillary facilities.

The following is a summary of the issues raised during the feedback session from the workshop participants regarding lessons learned during the expert and participant presentations and discussions.

- The topics effectively covered SPs over the full range of RRs:
 - From “Small” to “Big”, and of various statuses from
 - Planned, Under construction, Operational (both well-utilised and under-utilised), Shutdown, to Being Decommissioned
- There was in most cases a need for a national strategy and vision to enable the RR SP to be effectively applied
- Most (all) RRs were dependent on Government funding
- Assistance is readily available to help RR management - but managers need to be proactive
- The choices among E&T / R&D / and Irradiation Services (IS) and Isotope Production (IP) are not always that simple
 - The preferred government strategy is rather E&T than R&D
 - There is often insufficient funding to carry on these activities
 - IS and IP are generally considered for income generation
 - The RR remains as a service provider for the above and is not the service/product originator
- Common problems experienced across the RR SP profiles presented:
 - Funding
 - Loss of Personnel and expertise – Retirement, Relocation to industry
 - Ageing of staff and systems
 - Ability to find stakeholders/users and increase utilisation
 - Extended shutdown situation.

The workshop participants together with the experts also formulated a number of follow up recommendations to the teams involved in drafting facility SPs, namely they should:

- Revise their SPs according to the expert review comments and the lessons learned during the workshop;
- Follow-up the draft SPs by implementation, progress monitoring and evaluation, and review by facility’s own committee;
- Share the lessons learned with relevant staff, top down and bottom-up;
- Quantify capabilities, existing and future stakeholder’s needs; the latter in close communication with those stakeholders. If applicable, make an inventory of radionuclides and sources (and their strengths) imported and in use in the country;
- Establish and quantify the performance indicators for monitoring progress and provide baseline values for the status in the reference year;
- If applicable, initiate awareness building on RR utilization at universities and the public. If applicable, publish in the social media success stories of social-economical relevance;
- Consider professional help in marketing, advertisement and sales;
- Consider finding stakeholders also outside the country.

4. Review of the IAEA TECDOC-1212

As one of the key outcomes of the SP review meetings/workshops, it was identified that there is a need to revise the original TECDOC-1212 and to publish a new version that will provide an improved approach to assist both existing and new RR operating organizations. The review of the original TECDOC-1212 was also strongly recommended by the Technical Working Group on Research Reactors (TWGRR). The Agency, in addition to the above mentioned follow up workshops, has organized a dedicated consultancy meeting (in May 2014 in Vienna), where a group of international experts have proposed and provided inputs to the following new structure of the future IAEA publication:

Part 1 – Guidelines: The purpose of this part is to put the formulation of a strategic plan into perspective, to provide a rationale for the development of a strategic plan and to give an overview of the process.

Part 2 – Preparation of a Strategic Plan: The second part of the document is a more detailed guide. It gives a suggested format for the plan and describes the considerations and content of each section. Selected question sets are used which aim at assisting the facility management in tailoring the plan to meet its needs.

Part 3 – Guidance on Specific Topics: The third part contains guidance on how to evaluate the financial implications to operate the facility, increase stakeholder awareness of the existence of the facility and how to attract stakeholder utilization. As mentioned above, a change in management and personnel mind-set is sometimes necessary - this is also described in this part of the document.

In addition, several Annexes have been added to this revised version of the document and include examples to clarify the methodologies discussed in the document and to thereby assist the preparers of the strategic plan:

- Annex 1: Some strategic considerations that could be taken into account for the strategic plan's preparation;
- Annex 2: A template as an example of a typical strategic plan's layout;
- Annex 3: Clarification of the application of Strength-Weakness-Opportunity-Threat (SWOT) analysis and the relevant Probabilistic Risk Assessment (PRA) evaluation;
- Annex 4: A typical questionnaire as an example of surveys required to determine capabilities and competencies required for a new nuclear center;
- Annex 5: An example of evaluation methodologies for Key Performance Indicators (KPIs) required for a research reactor's utilization;
- Annex 6: Clarification of the concept of Eliminate-Reduce-Create-Raise (ERCR) analysis for achievement of an objective with a typical example; and
- Annex 7: A completed (but filtered) strategic plan from an operational research reactor.

The schematic structure outlined below in Figure 3 is an illustration of the revised approach that should be considered when regarding the development of a strategic plan and its intended outcome. The outcome (roof) of a successfully implemented SP must result in optimized Utilization and Sustainability of the RR during its lifetime. This can only be achieved if the support system (pillars) of the applicable Stakeholders are sufficiently well developed to ensure implementation – e.g. by utilization of irradiation services, existence of R&D projects, and need for Education and Training (E&T) activities. A sound basis (foundation) for the structure is built according to the Stakeholder Engagement (through their needs and interests) which ensures that the resources are made available. These resources are normally the facility itself, funds required and the staff operating and supporting the on-going activities.

Finally, it must be emphasized that the methodology for the preparation of a strategic plan as identified in this revised document is purely a guideline and is not mandatory – unless it is a specific requisite by the IAEA when evaluating requests for technical/financial assistance. The IAEA does not expect general publication of plans or public disclosure of the information contained therein. The IAEA, however, recommends that it will prioritize support requests for new ancillary facilities or equipment for RR utilization if they are accompanied by a strategic plan clearly demonstrating that the items requested are necessary to achieve the objectives of the plan.

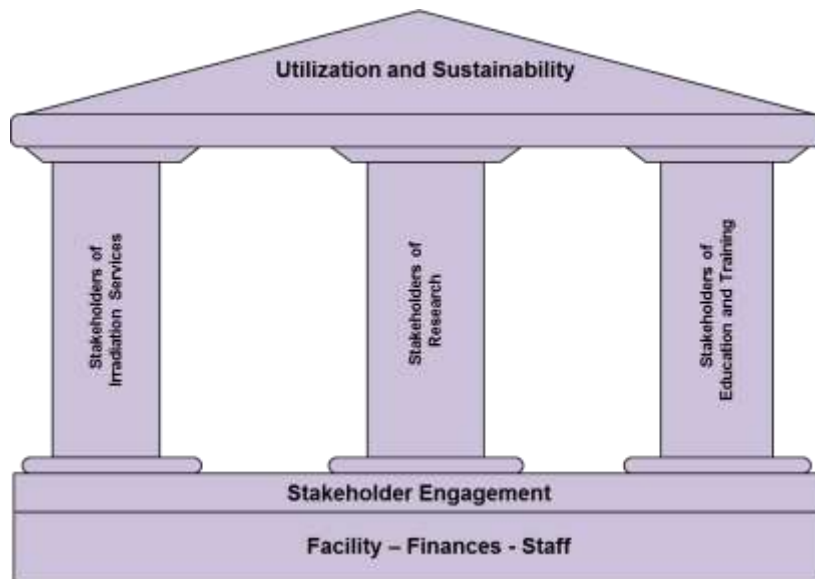


Figure 3: Modular approach for the strategic plan of a research reactor.

6. Conclusions

The IAEA is convinced that the long-term sustainability of many RRs around the world depends upon the development and implementation of an effective and achievable SP for their utilization. It is hoped that the revised guidelines on how to prepare, efficiently monitor and successfully implement the SPs for RR facilities together with the offered IAEA services in preparation and review of SP documents will prove to be a key element to enhance RR utilization and ensure long term sustainability of the products and services these facilities can provide.

References

- [1] INTERNATIONAL ATOMIC ENERGY AGENCY, Strategic Planning for Research Reactors — Guidance for Reactor Managers, IAEA TECDOC Series No. 1212, IAEA, Vienna (2001); presently under review with the new publication expected in 2015.
- [2] INTERNATIONAL ATOMIC ENERGY AGENCY, Specific considerations and milestones for a Research Reactor project, IAEA Nuclear Energy Series No. NP-T-5.1, IAEA, Vienna, (2012).
- [3] INTERNATIONAL ATOMIC ENERGY AGENCY, Applications of Research Reactors, IAEA Nuclear Energy Series, NP-T-5.3, IAEA, Vienna (2014).