

令和4年1月28日

国立研究開発法人日本原子力研究開発機構
原子力科学研究部門
部門長 大井川 宏之 殿

先端基礎研究・評価委員会
委員長 永長 直人

研究開発課題の評価結果について(答申)

当委員会に諮問[令 03 原機(先)004]のあった下記の研究開発課題の事後評価及び事前評価について、その評価結果を別紙のとおり答申します。

記

〔諮問事項〕

1. 第3期中長期計画における「先端原子力科学研究」に関する事後評価
2. 第4期中長期計画における「先端原子力科学研究」に関する事前評価

以上

Evaluation Report

1st Assessment Review Meeting for Advanced Science Research Center, JAEA

September 24th, 2021: 1st round of Pre-Review Part

2nd Assessment Review Meeting for Advanced Science Research Center, JAEA

January 11th, 2022: Post-Review Part:

January 14th, 2022: 2nd round of Pre-Review Part:

Report

January 28th, 2022: Submission of the Report:

Evaluation Committee Members of Advanced Science Research Center

Name	Position and affiliation	Speciality
BADER, Samuel	Argonne Distinguished Fellow, emeritus, Argonne National Laboratory	Physics
CLARK, Sue	Deputy Director, Science and Technology, The Savannah River National Laboratory	Chemistry
IYE, Yasuhiro	Board of Trustee Member, Vice Chancellor, Chubu University Professor Emeritus, The University of Tokyo	Physics
NAGAOSA, Naoto (Chair)	Deputy Center Director, Center for Emergent Matter Science, RIKEN Professor, The University of Tokyo	Physics
NAKANO, Takashi	Director and Professor, Research Center for Nuclear Physics, Osaka University	Physics
NAKATSUKASA, Takashi	Professor, Center for Computational Sciences, University of Tsukuba	Physics
TÜRLER, Andreas	Professor, Departement für Chemie, Biochemie und Pharmazie, Universität Bern	Chemistry
YOKOYAMA, Hiromi	Professor, KAVLI Institute for the Physics and Mathematics of Universe, The University of Tokyo	Science Technology Studies
YOSHINOBU, Jun	Vice Director and Professor, The Institute for Solid State Physics, The University of Tokyo	Chemistry

Post Evaluation Sheet for the Achievement in Middle-/Long-Term from FY 2015 to FY 2021

Advanced Science Research

	Points for the Evaluation (self-evaluation)		Evaluation of Committee		
	Reasons for each evaluation point	Evaluation	Comments	Evaluation	Evaluation
<u>Research and Development activity “Advanced Science Research”</u>	(1) <u>Achievement degree of R&D (comprehension and analysis of the reasons for success or failure)</u> Under the “Research First” principle, we have concentrated to show high performances in advanced researches in atomic energy sciences. We published over 1000 peer-review papers, including 21 editors’ choices and 42 top 5% papers, and 14 awards in total during these seven years. As a result, the ASRC is recognized as an internationally competitive organization in the areas of nuclear and hadron physics, spin and material sciences and environmental and chemical researches related to atomic energy.	S	Under the visionary leadership by the center directors Drs. S.Maekawa and M.Oka, ASRC has a remarkable record of achievements seen from the many publications with high impact, excellent human resource developments and fundamental contribution to the society. It has accomplished the original goal of “pursue principles and origins” and “development of basic science”, and contributed greatly to the visibility of JAEA.	S	S
	(2) <u>Validity of the initial R&D plan</u> In the previous 7-year term, we had three research areas with eleven research groups. In this term, we focused our research in two areas and started with six research groups. After the mid-term evaluation we have added one more group on theoretical physics in order to enhance the visibility of ASRC and cross-disciplinary researches across the Center. We believe that these goals were appropriate and have been fully satisfied.		Even with the appreciably reduced size of the steady budget for ASRC support, they have focused on nuclear and materials sciences and maintained high scientific activities with abundant achievements. The staff members have increased due to their effort during the last 7 years. They also launched a theory group to bridge the nuclear and material sciences, which successfully functions now.	S	
	(3) <u>Recognition and influences of the products/outcomes of R&D</u> Our main outcome is shown in the high performance in over 1000 peer-reviewed papers, many of which are highly recognized by the international community. By employing the Reimei research program, we carried out intensive collaborations with domestic and oversea institutions and established internationally leading roles in several areas of researches.		The scientific achievements of ASRC are remarkable with many high impact papers and international collaborations. It has contributed to the understanding of the principles behind the phenomena in nuclear systems and materials. It also contributed to the nuclear environmental science related to the atomic power plant. The Reimei program is unique to ASRC in that it continues to support collaborations both	S	

		domestic and international quite effectively.	
	<p><u>(4) Contribution to training and support of young researchers</u></p> <p>Our young members got six awards during this term, 1 from MEXT, 3 from scientific societies and 1 from a private foundation. We successfully got 12 tenure-track researcher positions, TAKUETSU, by MEXT, and seven have been promoted to permanent positions till the end of this term. Our PDs and senior PDs are also treated as tenure-track positions and ten were accepted as permanent staff during this term.</p>	ASRC attracts many excellent early-career scientists including TAKUETSU researchers. Also it has started organizing summer school for visiting students. Also, it organizes summer school and visiting students program. It has successfully promoted 17 early-career scientists to the permanent staff, and launched many to positions outside of the JAEA, e.g., universities and national institutes. These are excellent achievements in the training and support of these early-career scientists.	S
	<p><u>(5) Prospect of new projects and future R&D</u></p> <p>According to the recommendation of the mid-term evaluation in 2018, we started a new research group, Advanced Theoretical Physics (ATP) research group, which successfully achieved the designated goal of enhancing the communication and collaboration among the groups across ASRC. It also attracts several high-level PD researchers and activated the Center.</p> <p>In the new 7-year middle/long range plan period, we will continue and enhance the activities of the Center further.</p>	A new project that was launched is the Advanced Theoretical Physics (ATP) research group that bridges nuclear science and material science focusing on the nonequilibrium physics. Already some significant collaborative works have been achieved between the two fields. As for the future prospect, ASRC will enhance the present mission and goal contributing to innovations in basic science and interdisciplinary research.	S
	<p><u>(6) Appropriateness of domestic and international research collaborations</u></p> <p>The Reimei research program recruited many collaborative researches, every 6-8 themes per year, to bring new subjects and research areas, which enhances the research activity as well as the visibility of the ASRC.</p>	In addition to the Reimei research program, which is functioning quite effectively, each group in the ASRC performs domestic and international collaborative works on a daily basis. It is one of the most open platforms in Japan. Under the circumstance of various restrictions caused by COVID-19 pandemic, the researchers of ASRC have made their best effort to maintain and promote domestic and international collaborations.	S
	<p><u>(7) Appropriateness of approach to innovation</u></p> <p>Some of our achievements are patented and have potential to pursue industrial applications. We have ten domestic (four from Interfacial Reaction Field Chemistry, six from Spin-energy Transformation) and one foreign (from Materials Physics) patents.</p>	Innovation requires the deep understanding of the phenomena from the viewpoint of basic science. This is the important role, that the ASRC successfully undertakes in JAEA. In addition, it nurtures efforts to pursue patent applications both domestic and international.	S

<p><u>(8) Appropriateness of social implementation</u> The research on chemical extraction of heavy elements using emulsion flow technique has developed to a venture company, EFT Co. Ltd. This first venture company in JAEA shows a nice example of outcomes in social implementation.</p>		<p>It is notable that ASRC launched a venture company EFT Co. Ltd. as the first example in JAEA.</p>	S	
<p><u>(9) Adaptability to national policy on science and technology, social and economic significance, and social needs</u> JAEA is assigned to develop the nuclear innovation set by MEXT and has declared the “JAEA 2050+” future plan. The ASRC has been carried out the most basic research part of the JAEA mission. A few concrete outcomes are represented by the venture company EFT Co. Ltd., and the developments in spintronics and environmental chemical sciences.</p>		<p>The mission of ASRC is to promote basic science both in nuclear and materials sciences and trigger innovations. This fits well with national policy. Also, the interplay of the cooperative research between these two fields has been quite fruitful to produce new ideas. In addition, the ASRC also contributed to important applications in spintronics, in the extraction of heavy elements, and environmental science.</p>	S	
<p><u>(10) Public acceptance of R&D outcome (impact on society)</u> Some of our staff had lectures in universities through the system of linked graduate school (six members for five universities in 2021, for examples). For the general public, we joined some science events as the <i>Science Agora (JST)</i>, <i>Tsukuba Science Edge</i>, etc. We uploaded 4 introductory video movies as ‘JAEA channel’ during the term. The APS (American Physical Society) selected the ASRC as APS TV in 2018. For high-school education, we started a crowdfunding as ‘One nuclear chart for one high-schools’ in 2020. We have distributed 600 schools in Japan with the use of donations by supporters.</p>		<p>In addition to its contribution within the academic community, the ASRC has devoted much creative effort to activities that enlighten the public, such as via lectures at Science Agora, Tsukuba Science Edge, and video movies at “JAEA channel”. The distribution of ‘One nuclear chart for one high-schools’ by crowd-funding has also been a unique and useful project for the education of young students. The overall improvement of the public’s literacy on the nuclear science is destined to be most advantageous for both JAEA and the general public.</p>	S	
<p><u>(11) Validity of approach for developing human resources in nuclear energy field, innovation and digitalization fields, etc.</u> The ASRC plays a central role in recruiting and educating young students. Their experiences as research students (74 in total) and summer internship students (123 in total) have cultivated their interests in JAEA and indeed lead to employments at JAEA. Some members give lectures regularly at the Human Development Center at JAEA on various subjects related to atomic energy science.</p>		<p>ASRC takes advantage of fundamental science to attract students to nuclear energy field by providing a variety of educating programs with the opportunity to visit and stay at JAEA. Also the members of ASRC provide public lectures in and outside of the JAEA. The record for the development of human resources is very impressive considering the size of the center.</p>	S	

Total evaluation

Evaluation	Comments
S	The review committee is highly impressed by scientific and technical developments that have been achieved in spite of the restriction of financial and manpower resources ASRC has been showing best performance as possible in the severe environment of steady decrease in the budget. The decreasing steady budget from JAEA is threatening the long-term success of the ASRC, which is most important for fundamental science. Therefore, the steady increase in the core budget is strongly recommended by the committee, which is a most efficient investment to increase the visibility of the whole JAEA. It is a good aspect that ASRC can offer stable permanent positions for early-career scientists promoted from TAKUETSU and PD's, and these successful human resource developments are desired to be maintained and enhanced.

Evaluation category(criterion)

S: As a result of comprehensive consideration of the research results and efforts, etc. in comparison with the objectives, goals, plans, etc., and in consideration of various circumstances, it is recognized that the creation of particularly remarkable results and the expectation of the creation of future results, etc., toward "maximization of R&D results" are expected under appropriate, effective and efficient R&D management.

A: As a result of comprehensive consideration of the research results and efforts, etc. in comparison with the objectives, goals, plans, etc., and in consideration of various circumstances, it is recognized that the creation of remarkable results and the expectation of the creation of future results, etc., toward "maximization of R&D results" are expected under appropriate, effective and efficient R&D management.

B: As a result of comprehensive consideration of the research results and efforts, etc. in comparison with the objectives, goals, plans, etc., and in consideration of various circumstances, it is recognized that the creation of results and the expectation of the creation of future results, etc., toward "maximization of R&D results" are expected and steady R&D management is being carried out.

C: As a result of comprehensive consideration of the research results and efforts, etc. in comparison with the objectives, goals, plans, etc., and in consideration of various circumstances, further efforts and improvements are expected for "maximizing R&D results" and "appropriate, effective, and efficient R&D management."

D: As a result of comprehensive consideration of the research results and efforts, etc. in comparison with the objectives, goals, plans, etc., and in consideration of various circumstances, special efforts and improvements, including drastic reviews are required for "maximizing R&D results" and "appropriate, effective, and efficient R&D management."

Assessment of draft basic policy for Research and Development Activity “Advanced Science Research” ■ Reasonable □ To be improved

	Points for the Assessment	Evaluation from Committee
		Comments
<u>Research and Development Activity “Advanced Science Research”</u>	<p>(1) <u>Validity of the choice of the research theme:</u> (including the viewpoint of effectiveness and outcome)</p> <p>Is this research project appropriate for the promotion of the basic science in JAEA?</p> <p>Is this research is expected to release of original and advanced research outcomes within the next mid-term plan period?</p> <p>Is the international competitiveness sufficient?</p>	<p>The two projects, advanced actinides science and advanced nuclear materials science, bridged by the advanced theoretical physics group will contribute to the goals of carbon neutrality, nuclear science and technology, and human resources development, creating “multi-disciplinary knowledge” via innovative output in basic science by close collaborations within and outside of the Center. The ASRC is one of a few entities worldwide where both material science and nuclear science are studied within the same center. This will be advantageous to produce the unique, original, and useful research outcomes in the next mid-term plan period. The feasibility has been already proven by the achievements in 3rd mid-term plan period. The ASRC is already internationally competitive as exemplified by its excellent achievements, such as the measurement of ionization potentials of lawrencium, and the discovery of superconductivity in uranium compounds in strong magnetic fields. The ASRC also has been playing an important role in promoting experimental researches at J-PARC as a hub center for hadron physics, taking advantages of its location and strategic collaboration with the theory group.</p>
	<p>(2) <u>Validity of the direction, aim, and goal of the research projects:</u> (including the viewpoint of effectiveness and outcome)</p> <p>Are the research direction, aim and goal appropriate for the next mid-term period?</p> <p>Is the management system well prepared?</p> <p>Is it expected to publicize the research results and generate wide</p>	<p>Basically, the ASRC will reinvent and reinvigorate itself by identifying fruitful paths to explore, utilizing promising outcomes uncovered during the 3rd mid-term period. The ASRC will be energized by its long-standing vision of ‘research first’ that encourages objectives that possess broad perspectives and originality. The ASRC enhances its innovation from basic science by interdisciplinary collaborations and by utilizing the unique major research facilities of the JAEA. These are most appropriate for the ASRC since its mission is to create new science that</p>

	<p>interests?</p> <p>Are the personnel source and the budget suitable?</p>	<p>ultimately contributes to the wellbeing of human society. To secure the freedom and autonomy of the researchers is essential to keep the high creativity of ASRC, although mission-oriented tasks in JAEA sometimes accelerates the collaboration between the divisions and groups within the ASRC and could lead to entirely new outcomes.</p> <p>It is difficult to assess the plan for the 4th mid-term at this time since a clear picture is yet to be presented. If the ASRC chooses to proceed along the track of the 3rd mid-term, we would endorse and support the choice based on the high performance of the research groups. Still, since the turn of mid-term is a good opportunity to reassess the navigation of ASRC, it could be worthwhile to put on the table various possibilities of new research directions, such as medical applications and/or social scientific issues. Of course, it is unwise for ASRC to over-diversify its resources in order to seek new directions to the extent of sacrificing existing excellent activities.</p> <p>Emphasis on interdisciplinary research is well-received. A more concrete plan for the interdisciplinary research platform is awaited. The essential point is that the ASRC take the scientific initiative of prospective interdisciplinary research activities.</p> <p>As for the management system, the leadership by the center director has worked extremely well. In the 4th mid-term plan period the management will strive to achieve the budgetary and human resources needed to excel in its research activities and to further enhance its sterling international visibility. Human resources will include further growth in the goal of attaining gender equality via recruitment of more female scientists. The new director will reimagine links to medical applications and industrial outreach. For JAEA, we also recommend to maintain research environments of ASRC to respect researchers' own initiative as well as international collaborations.</p> <p>In the 3rd mid-term plan period, the Center has set a high bar. It has publicized research results effectively via press releases, it provided crowd funding for education (Chart of the Nuclides), and it spun off a venture company (Emulsion Flow Technologies Ltd.). These successful efforts will serve as</p>
--	--	--

		<p>a model to be transcended in the 4th mid-term plan period. The number of personnel has been level as the ASRC attracts early-career people as senior PDs. We believe it is of vital importance to maintain the liquidity of human resources.</p> <p>The fact that the ASRC successfully benefits from a substantial share of the presidential fund testifies that the activities of ASRC are highly appreciated by the governing board of JAEA. However, allocation of the presidential fund is on a year-by-year basis. This seems to imply that the funding be directed to such purposes as installation of new equipment and renewal of deteriorated ones, rather than to a multi-year commitment to a research project. Also, we are told that the presidential fund itself is subject to JAEA's yearly financial standing. It is highly desirable to secure a stable internal budget allocation to support long-term research.</p>
--	--	---

Evaluation sheet for the next Medium-/Long-Term Plan, from 2022 to 2028 (2nd round)

Evaluation of draft basic policy for Research and Development Activity “Advanced Science Research”

	Points for the Evaluation	Evaluation from Committee	
		Evaluation	Comments
<u>Research and Development Activity “Advanced Science Research”</u>	(1) <u>Validity of the selection of the R&D theme:</u> (including the viewpoint of effectiveness and outcome)*	<input checked="" type="checkbox"/> proper <input type="checkbox"/> improper	Already received in the first meeting on Sep. 24, 2021
	(2) <u>Validity of the policy, purpose, and goal of the R &D:</u> (including the viewpoint of effectiveness and outcome)	<input checked="" type="checkbox"/> proper <input type="checkbox"/> improper	Already received in the first meeting on Sep. 24, 2021
	(3) <u>Validity of process of the R&D</u> In ASRC, the Director General is invited from outside, and advanced nuclear science research is being promoted under his strong leadership. We set 7 research themes for the mid-term: <u>Advanced Actinides Nuclear Science</u> - Strongly Correlated Actinides Science - Exotic Heavy Element Nuclear Science - Hadron Nuclear Physics <u>Advanced Nuclear Materials Science</u> - Spin-energy Science - Surface and Interface Science - Sustainable Functional Materials Science <u>Advanced Theoretical Physics</u> - Advanced Theoretical Physics We newly set a Sustainable Functional Materials for fundamental research on the creation of materials for the realization of carbon neutrality and Society 5.0 is made. 5 of 7 group leaders are professors appointed from domestic universities to gain a broader perspective on research and to raise our research ambitions. For each group lead by a guest leader, we set a (research) manager from internal staff for its close cooperation. The research coordination and promotion office of ASRC supports administrative works as international contract, treatment of extern funds, etc. In addition, for interdisciplinary collaborative research aimed at	<input checked="" type="checkbox"/> proper <input type="checkbox"/> improper	The ASRC invited five PIs from domestic universities. Now all the PIs are Japanese. This will enhance the involvement of the PIs with more frequent visits to the ASRC. On the other hand, the ASRC should promote international collaborations even more than before by <i>e.g.</i> the Reimei program, engaging exchange researchers, and organizing conferences. The group leaders of foreign nationality in the previous midterm must have played active role in developing international connection. In the coming midterm, it is highly desirable to devise an effective way to secure international channel of collaboration and recruitment of early career researchers from abroad. It is a clever way to put a manager, who is a full-time researcher at the ASRC, for each group with an invited PI to ensure the steady functioning of the group. The research directions in the new 4 th mid-term mostly builds upon that of 3 rd mid-term, which was so successful in contributing to

<p>innovation, the strategic flexible system of forming project teams that transcend the boundaries of the groups is thought be appropriate for carrying out the goals of ASRC.</p>		<p>fundamental science and inter-disciplinary fields. The restructuring of the group that replaces the interfacial chemistry group by a new sustainable functional materials group aims to create materials that contribute to Society 5.0. This will increase the synergistic effects of the whole activity of ASRC by opening many possibilities to collaborate with other groups in the center. Interdisciplinary collaborative research is another mechanism to accelerate innovation, where the leadership of the Director will be most important.</p>
<p><u>(4) Validity of the allocating plan of the R&D resources such as funds, manpower and framework</u></p> <p>In the prior 7 years, ASRC was assigned about 100 million JPY as an internal regular funding, as well as 200 million JPY of President's discretionary funds as an internal competitive budget. Furthermore, we also acquired external funds such as KAKENNHI, which exceeded the regular assignment. The ASRC will continue to promote competitive research and obtain research funds in the same way. However, constant support as a regular funding from JAEA is essential for ASRC to lead the creation of innovation and human resource development in JAEA, and therefore, we will continue to require its enhancement.</p> <p>In the Center, the Director General conducts group's interviews two times in a year for confirming of their progress and requirement of budget, and allocate resources. For individual persons, we set the Director General's interview in every February, and grasp each staff's activities. A few best performances are selected each year for the Director's Awards (Support to expense of participating an international conference).</p>	<p><input checked="" type="checkbox"/>proper</p> <p><input type="checkbox"/>improper</p>	<p>The Director General is planning to communicate with each group twice a year to grasp its status and allocate resources. Our suggestion is to have Deputy Directors to form a core-member committee that serves as the top management of the Center to discuss the most important issues, such as allocation of resources.</p> <p>Since ASRC is a Center for basic science, ambitious long-term projects should be encouraged. Therefore, we suggest the JAEA to increase the core budget. From the ASRC side, efforts to obtain competitive funding should be pursued as before.</p>
<p><u>(5) Validity of collaboration with domestic and international organizations</u> (excluding in the fields of nuclear energy)</p> <p>Many research collaborations have been conducted including many international ones, especially through the Reimei Research Program. The Reimei program started in 2010. During 12 years, we have</p>	<p><input checked="" type="checkbox"/>proper</p> <p><input type="checkbox"/>improper</p>	<p>ASRC is one of the most international centers in Japan having many collaborations with foreign and domestic institutions. The Reimei program has been successful in organizing more than 60 workshop. It will</p>

	<p>contracted collaborative researches with 35 institutes/universities. These programs triggered some advancements: we invited 2 guest GLs (A. Andreyev (U. York), B. Grambow (SUBATECH)), we started the einsteinium program corroborated with ORNL, and we launched some programs with budget of over 10 million yen supported by external funds.</p> <p>The approved research themes in 2021 are as follows:</p> <p>1)S. GO (Kyushu Univ.) Isomer spectroscopy on actinide targets: a link to the island of stability</p> <p>2)G. SUZAKI (Hokkaido Univ.) Study of dynamics of phase change and element transfer at interfaces by laser confocal microscopy combined with differential interference microscopy</p> <p>3) J. Pochodzalla (University Mainz) Systems with two strange quarks at FAIR and J-PARC</p> <p>4)Su Hong Lee (Yonsei Univ.) Collaborative research to evaluate QCD vacuum properties at high density from ϕ meson decay inside the nucleus</p> <p>5) Timothy Ziman (Institut Laue Langevin) New materials for spintronics assessed by quantum beams</p> <p>6)N. HATANO (Univ. Tokyo) Non-Hermitian physics for open quantum and quasi-stable systems</p> <p>The Reimei program is required to hold an international workshop for each program. There are over 60 Reimei workshops in past.</p> <p>This will continue to be promoted in the next term.</p>		<p>continue to be effective to promote worldwide networks in the future.</p> <p>The only concerns are the steady source of the budget for these international collaborations, and the new research style with/after COVID-19. For the former, support from JAEA is indispensable, while the consolidation of facilities, such as for hybrid conferences should be quite useful.</p>
	<p><u>(6) Possibilities to create innovation and validity of the action plans for them</u></p> <p>It is expected to produce results by promoting interdisciplinary research collaboration for innovation in a strategic and flexible system that transcends the boundaries of groups under the leadership of the new Director General.</p> <p><u>Establishment of Heavy Ion Nuclear Science Center</u></p> <ul style="list-style-type: none"> - Research for the island of stability of superheavy elements, etc. - Development of α-emitters for medical application, etc. <p><u>New developments in heavy element science</u></p> <ul style="list-style-type: none"> - Deepening of understanding of electronic structure of 5f systems - Application to quantum computing <p><u>Hydrogen isotope science/Hydrogen simulator</u></p> <p><u>Creation of radiation-resistant functional materials/ Materials modification by irradiation</u></p> <p>These themes are promoted with internal/external facilities as JAEA tandem accelerator, J-PARC, JRR3, SPring-8, JAEA Supercomputer, <i>Fugaku</i>, etc.).</p>	<p><input checked="" type="checkbox"/>proper</p> <p><input type="checkbox"/>improper</p>	<p>The ASRC is planning to launch a scheme to promote interdisciplinary research by bridging multiple groups within and outside of the Center. The scheduled themes of this program are promising ones related to nuclear science and materials science including heavy ion nuclear science, heavy element science, hydrogen isotope science, hydrogen simulator, and radiation-resistant materials. The ASRC is expected to act as the hub of these collaborations and ignite innovative research by the strong leadership of the Director General.</p>
	<p><u>(7) Validity of the action plan for social implementation</u> (including the construction and provision of technology and knowledge based on platforms)</p> <p>While research in basic nuclear science is in progress in the ASRC, it has obtained 10 domestic patents (4 in Interfacial Reaction-field</p>	<p><input checked="" type="checkbox"/>proper</p> <p><input type="checkbox"/>improper</p>	<p>Even though the ASRC aims at basic science and interdisciplinary research, it has been conscious of applications and social implementation. Patent applications and the</p>

<p>Chemistry RG and 6 in Spin-energy Transformation Science RG) and 1 foreign patent (Heavy Element Materials Physics RG) in the prior term. These results are considered to have a potential for a startup such as Emulsion Flow Technology Inc. In the next term, we plan to further strengthen industry-academia research collaboration with a focus on materials research.</p>		<p>startup of a venture company are examples in this direction. In the 4th mid-term, the newly launched sustainable functional materials group will strengthen the materials sciences to contribute more to this direction by producing the interplay between basic science and applications.</p>
<p><u>(8) Adaptability for national policy about science and technology, social and economic significance, and social needs</u> JAEA was established by MEXT to develop the nuclear innovation and has declared the future vision, “JAEA 2050+”. ASRC is to carry out basic science research which is one of the most important missions of JAEA, but it is also expected to contribute to carbon neutrality, Society 5.0, and SDGs by promoting the circulation of basic and applied research. In addition, the next term calls for strengthening materials research, which is positioned as one of the strategic fields in the Science and Technology Innovation Plan by the Japanese government.</p>	<p><input checked="" type="checkbox"/>proper <input type="checkbox"/>improper</p>	<p>The future vision “JAEA 2050+” is closely related to the national policy, such as Society 5.0 and SDG’s. The ASRC is conscious of these challenges and contributes from the basic science side. Carbon neutrality is an example, where many groups in the ASRC could play crucial roles. Its purpose fits well with the development of nuclear science and technology, human resources development, creating “multi-disciplinary knowledge” via innovative output. Materials science is the basis of every technology. Launching the sustainable functional materials group fits very well with the strategic vision in the Science and Technology Innovation Plan by the Japanese government.</p>
<p><u>(9) Public acceptance of R&D theme/output (assumed degree of those impacts on society)</u> In the prior term, ASRC achieved more than 1,000 refereed papers, 21 notable papers, 42 top 5% papers, and 14 with external awards. In the next term, in order to achieve higher quality results, we are preparing for a system under the new Director General.</p>	<p><input checked="" type="checkbox"/>proper <input type="checkbox"/>improper</p>	<p>In the field of basic science, the ASRC has an outstanding record of publications and invited talks, indicating its prestigious position, which contributes greatly to the stature and visibility of the JAEA. This will be the case even more so in the 4th mid-term with the strong leadership of the Director General.</p>
<p><u>(10) Validity of approach for human resource development (human resources in nuclear energy field, innovation and digitalization fields, etc.)</u> ASRC accepts about 10 research fellowship students, 10 student research associates, and 10 to 20 summer trainees every year. We also</p>	<p><input checked="" type="checkbox"/>proper <input type="checkbox"/>improper</p>	<p>The ASRC has been successful in human resources development, supplying excellent people in and outside of JAEA. By accepting research fellowship students and student</p>

	<p>plan to continue these efforts in the next term. Furthermore, we will pay particular attention to the promotion of diversity for human resource development.</p>	<p>research associates as summer trainees, it invests a significant effort to educate the researchers of the next generation. The number of female scientists has increased and should increase further, including in leadership roles within the groups and the Center. These efforts will be enhanced also in the 4th mid-term.</p>
--	---	--

- * Scientific and technical significance (especially in basic research, significance should be placed on "creation of intelligence"), (2)social and economic significance, (3)significance as a R&D using national expenditure (for projects (not R&D), i)urgency, ii)cost-effectiveness, iii)balance of resource distribution, and iv)social and economic needs should also be evaluated), (4)(expected) direct/indirect results and effects, and other ripple effect should be described and evaluated.

1. Post-Review for Advanced Science Research in Middle-/Long-Term from FY 2015 to FY 2021

(1) Achievement degree of R&D

(self-evaluation) Under the "Research First" principle, we have concentrated to show high performances in advanced researches in atomic energy sciences. We published over 1000 peer-review papers, including 21 editors' choices and 42 top 5% papers, and 14 awards in total during these seven years. As a result, the ASRC is recognized as an internationally competitive organization in the areas of nuclear and hadron physics, spin and material sciences and environmental and chemical researches related to atomic energy.

Evaluation of Committees:

Under the visionary leadership by the center directors Drs. S. Maekawa and M. Oka, ASRC has a remarkable record of achievements seen from the many publications with high impact, excellent human resource developments and fundamental contribution to the society. It has accomplished the original goal of "pursue principles and origins" and "development of basic science", and contributed greatly to the visibility of JAEA.

Score: S

(2) Validity of the initial R&D plan

(self-evaluation) In the previous 7-year term, we had three research areas with eleven research groups. In this term, we focused our research in two areas and started with six research groups. After the mid-term evaluation we have added one more group on theoretical physics in order to enhance the visibility of ASRC and cross-disciplinary researches across the Center. We believe that these goals were appropriate and have been fully satisfied.

Evaluation of Committees:

Even with the appreciably reduced size of the steady budget for ASRC support, they have focused on nuclear and materials sciences and maintained high scientific activities with abundant achievements. The staff members have increased due to their effort during the last 7 years. They also launched a theory group to bridge the nuclear and material sciences, which successfully functions now.

Score: S

(3) Recognition and influences of the products/outcomes of R&D

(self-evaluation) Our main outcome is shown in the high performance in over 1000 peer-reviewed papers, many of which are highly recognized by the international community. By employing the Reimei research

program, we carried out intensive collaborations with domestic and oversea institutions and established internationally leading roles in several areas of researches.

Evaluation of Committees:

The scientific achievements of ASRC are remarkable with many high impact papers and international collaborations. It has contributed to the understanding of the principles behind the phenomena in nuclear systems and materials. It also contributed to the nuclear environmental science related to the atomic power plant. The Reimei program is unique to ASRC in that it continues to support collaborations both domestic and international quite effectively.

Score: S

(4) Contribution to training and support of young researchers

(self-evaluation) Our young members got six awards during this term, 1 from MEXT, 3 from scientific societies and 1 from a private foundation. We successfully got 12 tenure-track researcher positions, TAKUETSU, by MEXT, and seven have been promoted to permanent positions till the end of this term. Our PDs and senior PDs are also treated as tenure-track positions and ten were accepted as permanent staff during this term.

Evaluation of Committees:

ASRC attracts many excellent early-career scientists including TAKUETSU researchers. Also it has started organizing summer school for visiting students. Also, it organizes summer school and visiting students program. It has successfully promoted 17 early-career scientists to the permanent staff, and launched many to positions outside of the JAEA, e.g., universities and national institutes. These are excellent achievements in the training and support of these early-career scientists.

Score: S

(5) Prospect of new projects and future R&D

(self-evaluation) According to the recommendation of the mid-term evaluation in 2018, we started a new research group, Advanced Theoretical Physics (ATP) research group, which successfully achieved the designated goal of enhancing the communication and collaboration among the groups across ASRC. It also attracts several high-level PD researchers and activated the Center. In the new 7-year middle/long range plan period, we will continue and enhance the activities of the Center further.

Evaluation of Committees:

A new project that was launched is the Advanced Theoretical Physics (ATP) research group that bridges nuclear science and material science focusing on the nonequilibrium physics. Already some significant collaborative works have been achieved between the two fields.

As for the future prospect, ASRC will enhance the present mission and goal contributing to innovations in basic science and interdisciplinary research.

Score: S

(6) Appropriateness of domestic and international research collaborations

(self-evaluation) The Reimei research program recruited many collaborative researches, every 6-8 themes per year, to bring new subjects and research areas, which enhances the research activity as well as the visibility of the ASRC.

Evaluation of Committees:

In addition to the Reimei research program, which is functioning quite effectively, each group in the ASRC performs domestic and international collaborative works on a daily basis. It is one of the most open platforms in Japan.

Under the circumstance of various restrictions caused by COVID-19 pandemic, the researchers of ASRC have made their best effort to maintain and promote domestic and international collaborations.

Score: S

(7) Appropriateness of approach to innovation

(self-evaluation) Some of our achievements are patented and have potential to pursue industrial applications. We have ten domestic (four from Interfacial Reaction Field Chemistry, six from Spin-energy Transformation) and one foreign (from Materials Physics) patents.

Evaluation of Committees:

Innovation requires the deep understanding of the phenomena from the viewpoint of basic science. This is the important role, that the ASRC successfully undertakes in JAEA. In addition, it nurtures efforts to pursue patent applications both domestic and international.

Score: S

(8) Appropriateness of social implementation

(self-evaluation) The research on chemical extraction of heavy elements using emulsion flow technique has developed to a venture company, EFT Co. Ltd. This first venture company in JAEA shows a nice example of outcomes in social implementation.

Evaluation of Committees:

It is notable that ASRC launched a venture company EFT Co. Ltd. as the first example in JAEA.

Score: S

(9) Adaptability to national policy on science and technology, social and economic significance, and social needs

(self-evaluation) JAEA is assigned to develop the nuclear innovation set by MEXT and has declared the "JAEA 2050+" future plan. The ASRC has been carried out the most basic research part of the JAEA mission. A few concrete outcomes are represented by the venture company EFT Co. Ltd., and the developments in spintronics and environmental chemical sciences.

Evaluation of Committees:

The mission of ASRC is to promote basic science both in nuclear and materials sciences and trigger innovations. This fits well with national policy. Also, the interplay of the cooperative research between these two fields has been quite fruitful to produce new ideas. In addition, the ASRC also contributed to important applications in spintronics, in the extraction of heavy elements, and environmental science.

Score: S

(10) Public acceptance of R&D outcome

(self-evaluation) Some of our staff had lectures in universities through the system of linked graduate school (six members for five universities in 2021, for examples). For the general public, we joined some science events as the Science Agora (JST), Tsukuba Science Edge, etc. We uploaded 4 introductory video movies as 'JAEA channel' during the term. The APS (American Physical Society) selected the ASRC as APS TV in 2018.

For high-school education, we started a crowdfunding as 'One nuclear chart for one high-schools' in 2020. We have distributed 600 schools in Japan with the use of donations by supporters.

Evaluation of Committees:

In addition to its contribution within the academic community, the ASRC has devoted much creative effort to activities that enlighten the public, such as via lectures at Science Agora, Tsukuba Science Edge, and video movies at "JAEA channel". The distribution of 'One nuclear chart for one high-schools' by crowd-funding has also been a unique and useful project for the education of young students. The overall improvement of the public's literacy on the nuclear science is destined to be most advantageous for both JAEA and the general public.

Score: S

(11) Validity of approach for developing human resources in nuclear energy field, innovation and digitalization fields, etc.

(self-evaluation) The ASRC plays a central role in recruiting and educating young students. Their experiences as research students (74 in total) and summer internship students (123 in total) have cultivated their interests in JAEA and indeed lead to employments at JAEA.

Some members give lectures regularly at the Human Development Center at JAEA on various subjects related to atomic energy science.

Evaluation of Committees:

ASRC takes advantage of fundamental science to attract students to nuclear energy field by providing a variety of educating programs with the opportunity to visit and stay at JAEA. Also the members of ASRC provide public lectures in and outside of the JAEA. The record for the development of human resources is very impressive considering the size of the center.

Score: S

Total evaluation:

The review committee is highly impressed by scientific and technical developments that have been achieved in spite of the restriction of financial and manpower resources ASRC has been showing best performance as possible in the severe environment of steady decrease in the budget. The decreasing steady budget from JAEA is threatening the long-term success of the ASRC, which is most important for fundamental science. Therefore, the steady increase in the core budget is strongly recommended by the committee, which is a most efficient investment to increase the visibility of the whole JAEA. It is a good aspect that ASRC can offer stable permanent positions for early-career scientists promoted from TAKUETSU and PD's, and these successful human resource developments are desired to be maintained and enhanced.

Score: S

2. Pre-Review for Advanced Science Research in Middle-/Long-Term from FY 2022 to FY 2028

(1) Validity of the selection of the R&D theme:

(No self-evaluation)

Evaluation of Committees:

The two projects, advanced actinides science and advanced nuclear materials science, bridged by the advanced theoretical physics group will contribute to the goals of carbon neutrality, nuclear science and technology, and human resources development, creating “multi-disciplinary knowledge” via innovative output in basic science by close collaborations within and outside of the Center. The ASRC is one of a few entities worldwide where both material science and nuclear science are studied within the same center. This will be advantageous to produce the unique, original, and useful research outcomes in the next mid-term plan period. The feasibility has been already proven by the achievements in 3rd mid-term plan period. The ASRC is already internationally competitive as exemplified by its excellent achievements, such as the measurement of ionization potentials of lawrencium, and the discovery of superconductivity in uranium compounds in strong magnetic fields. The ASRC also has been playing an important role in promoting experimental researches at J- PARC as a hub center for hadron physics, taking advantages of its location and strategic collaboration with the theory group.

Evaluation: Proper

(2) Validity of the policy, purpose, and goal of the R &D:

(No self-evaluation)

Evaluation of Committees:

Basically, the ASRC will reinvent and reinvigorate itself by identifying fruitful paths to explore, utilizing promising outcomes uncovered during the 3rd mid-term period. The ASRC will be energized by its long-standing vision of ‘research first’ that encourages objectives that possess broad perspectives and originality. The ASRC enhances its innovation from basic science by interdisciplinary collaborations and by utilizing the unique major research facilities of the JAEA. These are most appropriate for the ASRC since its mission is to create new science that ultimately contributes to the wellbeing of human society. To secure the freedom and autonomy of the researchers is essential to keep the high creativity of ASRC, although mission-oriented tasks in JAEA sometimes accelerates the collaboration between the divisions and groups within the ASRC and could lead to entirely new outcomes.

It is difficult to assess the plan for the 4th mid-term at this time since a clear picture is yet to be presented. If the ASRC chooses to proceed along the track of the 3rd mid-term, we would endorse and support the choice based on the high performance of the research groups. Still, since the turn of mid-term is a good opportunity to reassess the navigation of ASRC, it could be worthwhile to put on the table various possibilities of new research directions, such as medical applications and/or social scientific issues. Of course, it is unwise for ASRC to over-diversify its resources in order to seek new directions to the extent of sacrificing existing excellent activities.

Emphasis on interdisciplinary research is well-received. A more concrete plan for the interdisciplinary research platform is awaited. The essential point is that the ASRC take the scientific initiative of prospective interdisciplinary research activities.

As for the management system, the leadership by the center director has worked extremely well. In the 4th mid-term plan period the management will strive to achieve the budgetary and human resources needed to excel in its research activities and to further enhance its sterling international visibility. Human resources will include further growth in the goal of attaining gender equality via recruitment of more female scientists. The new director will reimagine links to medical applications and industrial outreach. For JAEA, we also recommend to maintain research environments of ASRC to respect researchers' own initiative as well as international collaborations.

In the 3rd mid-term plan period, the Center has set a high bar. It has publicized research results effectively via press releases, it provided crowd funding for education (Chart of the Nuclides), and it spun off a venture company (Emulsion Flow Technologies Ltd.). These successful efforts will serve as a model to be transcended in the 4th mid-term plan period. The number of personnel has been level as the ASRC attracts early-career people as senior PDs. We believe it is of vital importance to maintain the liquidity of human resources.

The fact that the ASRC successfully benefits from a substantial share of the presidential fund testifies that the activities of ASRC are highly appreciated by the governing board of JAEA. However, allocation of the presidential fund is on a year-by-year basis. This seems to imply that the funding be directed to such purposes as installation of new equipment and renewal of deteriorated ones, rather than to a multi-year commitment to a research project. Also, we are told that the presidential fund itself is subject to JAEA's yearly financial standing. It is highly desirable to secure a stable internal budget allocation to support long-term research.

Evaluation: Proper

(3) Validity of process of the R&D:

(Self-evaluation) In ASRC, the Director General is invited from outside, and advanced nuclear science research is being promoted under his strong leadership. We set 7 research themes for the mid-term:
Advanced Actinides Nuclear Science
- Strongly Correlated Actinides Science

- Exotic Heavy Element Nuclear Science
- Hadron Nuclear Physics
- Advanced Nuclear Materials Science
- Spin-energy Science
- Surface and Interface Science
- Sustainable Functional Materials Science
- Advanced Theoretical Physics
- Advanced Theoretical Physics

We newly set a **Sustainable Functional Materials** for fundamental research on the creation of materials for the realization of carbon neutrality and Society 5.0 is made.

5 of 7 group leaders are professors appointed from domestic universities to gain a broader perspective on research and to raise our research ambitions. For each group lead by a guest leader, we set a (research) manager from internal staff for its close cooperation. The research coordination and promotion office of ASRC supports administrative works as international contract, treatment of extern funds, etc.

In addition, for interdisciplinary collaborative research aimed at innovation, the strategic flexible system of forming project teams that transcend the boundaries of the groups is thought be appropriate for carrying out the goals of ASRC.

Evaluation of Committees:

The ASRC invited five PIs from domestic universities. Now all the PIs are Japanese. This will enhance the involvement of the PIs with more frequent visits to the ASRC. On the other hand, the ASRC should promote international collaborations even more than before by *e.g.* the Reimei program, engaging exchange researchers, and organizing conferences.

The group leaders of foreign nationality in the previous midterm must have played active role in developing international connection. In the coming midterm, it is highly desirable to devise an effective way to secure international channel of collaboration and recruitment of early carrier researchers from abroad.

It is a clever way to put a manager, who is a full-time researcher at the ASRC, for each group with an invited PI to ensure the steady functioning of the group.

The research directions in the new 4th mid-term mostly builds upon that of 3rd mid-term, which was so successful in contributing to fundamental science and inter-disciplinary fields. The restructuring of the group that replaces the interfacial chemistry group by a new sustainable functional materials group aims to create materials that contribute to Society 5.0. This will increase the synergistic effects of the whole activity of ASRC by opening many possibilities to collaborate with other groups in the center. Interdisciplinary collaborative research is another mechanism to accelerate innovation, where the leadership of the Director will be most important.

Evaluation: Proper

(4) Validity of the allocating plan of the R&D resources such as funds, manpower and framework

(Self-evaluation) In the prior 7 years, ASRC was assigned about 100 million JPY as an internal regular funding, as well as 200 million JPY of President's discretionary funds as an internal competitive budget. Furthermore, we also acquired external funds such as KAKENNHI, which exceeded the regular assignment. The ASRC will continue to promote competitive research and obtain research funds in the same way. However, constant support as a regular funding from JAEA is essential for ASRC to lead the creation of innovation and human resource development in JAEA, and therefore, we will continue to require its enhancement.

In the Center, the Director General conducts group's interviews two times in a year for confirming of their progress and requirement of budget, and allocate resources. For individual persons, we set the Director General's interview in every February, and grasp each staff's activities. A few best performances are selected each year for the Director's Awards (Support to expense of participating an international conference).

Evaluation of Committees:

The Director General is planning to communicate with each group twice a year to grasp its status and allocate resources. Our suggestion is to have Deputy Directors to form a core-member committee that serves as the top management of the Center to discuss the most important issues, such as allocation of resources.

Since ASRC is a Center for basic science, ambitious long-term projects should be encouraged. Therefore, we suggest the JAEA to increase the core budget. From the ASRC side, efforts to obtain competitive funding should be pursued as before.

Evaluation: Proper

(5) Validity of collaboration with domestic and international organizations (excluding in the fields of nuclear energy)

(Self-evaluation) Many research collaborations have been conducted including many international ones, especially through the Reimei Research Program. The Reimei program started in 2010. During 12 years, we have contracted collaborative researches with 35 institutes/universities. These programs triggered some advancements: we invited 2 guest GLs (A. Andreyev (U. York), B. Grambow (SUBATECH)), we started the einsteinium program corroborated with ORNL, and we launched some programs with budget of over 10 million yen supported by external funds.

The approved research themes in 2021 are as follows:

1)S. GO (Kyushu Univ.) Isomer spectroscopy on actinide targets: a link to the island of stability

2)G. SUZAKI (Hokkaido Univ.) Study of dynamics of phase change and element transfer at interfaces by laser confocal microscopy combined with differential interference microscopy

3)J. Pochodzalla (University Mainz) Systems with two strange quarks at FAIR and J-PARC

4)Su Hounng Lee (Yonsei Univ.) Collaborative research to evaluate QCD vacuum properties at high density from ϕ meson decay inside the nucleus

5) Timothy Ziman (Institut Laue Langevin) New materials for spintronics assessed by quantum beams 6)N. HATANO (Univ. Tokyo) Non-Hermitian physics for open quantum and quasi-stable systems

The Reimei program is required to hold an international workshop for each program. There are over 60 Reimei workshops in past.

This will continue to be promoted in the next term.

Evaluation of Committees:

ASRC is one of the most international centers in Japan having many collaborations with foreign and domestic institutions. The Reimei program has been successful in organizing more than 60 workshop. It will continue to be effective to promote worldwide networks in the future. The only concerns are the steady source of the budget for these international collaborations, and the new research style with/after COVID-19. For the former, support from JAEA is indispensable, while the consolidation of facilities, such as for hybrid conferences should be quite useful.

Evaluation: Proper

(6) Possibilities to create innovation and validity of the action plans for them

(Self-evaluation) It is expected to produce results by promoting interdisciplinary research collaboration for innovation in a strategic and flexible system that transcends the boundaries of groups under the leadership of the new Director General.

Establishment of Heavy Ion Nuclear Science Center

- Research for the island of stability of superheavy elements, etc.

- Development of α -emitters for medical application, etc.

New developments in heavy element science

- Deepening of understanding of electronic structure of 5f systems

- Application to quantum computing

Hydrogen isotope science/Hydrogen simulator

Creation of radiation-resistant functional materials/ Materials modification by irradiation

These themes are promoted with internal/external facilities as JAEA tandem accelerator, J-PARC, JRR3, SPring-8, JAEA Supercomputer, Fugaku, etc.).

Evaluation of Committees:

The ASRC is planning to launch a scheme to promote interdisciplinary research by bridging multiple groups within and outside of the Center. The scheduled themes of this program are promising ones related to nuclear science and materials science including heavy ion nuclear science, heavy element science, hydrogen isotope science, hydrogen simulator, and radiation-resistant materials. The ASRC is expected to act as the hub of these collaborations and ignite innovative research by the strong leadership of the Director General.

Evaluation: Proper

(7) Validity of the action plan for social implementation (including the construction and provision of technology and knowledge based on platforms)

(Self-evaluation) While research in basic nuclear science is in progress in the ASRC, it has obtained 10 domestic patents (4 in Interfacial Reaction-field Chemistry RG and 6 in Spin-energy Transformation Science RG) and 1 foreign patent (Heavy Element Materials Physics RG) in the prior term. These results are considered to have a potential for a startup such as Emulsion Flow Technology Inc. In the next term, we plan to further strengthen industry-academia research collaboration with a focus on materials research.

Evaluation of Committees:

Even though the ASRC aims at basic science and interdisciplinary research, it has been conscious of applications and social implementation. Patent applications and the startup of a venture company are examples in this direction. In the 4th mid-term, the newly launched sustainable functional materials group will strengthen the materials sciences to contribute more to this direction by producing the interplay between basic science and applications.

Evaluation: Proper

(8) Adaptability for national policy about science and technology, social and economic significance, and social needs

(Self-evaluation) JAEA was established by MEXT to develop the nuclear innovation and has declared the future vision, “JAEA 2050+”. ASRC is to carry out basic science research which is one of the most important missions of JAEA, but it is also expected to contribute to carbon neutrality, Society 5.0, and SDGs by promoting the circulation of basic and applied research. In addition, the next term calls for strengthening materials research, which is positioned as one of the strategic fields in the Science and Technology Innovation Plan by the Japanese government.

Evaluation of Committees:

The future vision “JAEA 2050+” is closely related to the national policy, such as Society 5.0 and SDG’s. The ASRC is conscious of these challenges and contributes from the basic science side. Carbon neutrality is an example, where many groups in the ASRC could play crucial roles. Its purpose fits well with the development of nuclear science and technology, human resources development, creating “multi-disciplinary knowledge” via innovative output. Materials science is the basis of every technology. Launching the sustainable functional materials group fits very well with the strategic vision in the Science and Technology Innovation Plan by the Japanese government.

Evaluation: Proper

(9) Public acceptance of R&D theme/output (assumed degree of those impacts on society)

(Self-evaluation) In the prior term, ASRC achieved more than 1,000 refereed papers, 21 notable papers, 42 top 5% papers, and 14 with external awards. In the next term, in order to achieve higher quality results, we are preparing for a system under the new Director General.

Evaluation of Committees:

In the field of basic science, the ASRC has an outstanding record of publications and invited talks, indicating its prestigious position, which contributes greatly to the stature and visibility of the JAEA. This will be the case even more so in the 4th mid-term with the strong leadership of the Director General.

Evaluation: Proper

(10) Validity of approach for human resource development (human resources in nuclear energy field, innovation and digitalization fields, etc.)

(Self-evaluation) ASRC accepts about 10 research fellowship students, 10 student research associates, and 10 to 20 summer trainees every year. We also plan to continue these efforts in the next term. Furthermore, we will pay particular attention to the promotion of diversity for human resource development.

Evaluation of Committees:

The ASRC has been successful in human resources development, supplying excellent people in and outside of JAEA. By accepting research fellowship students and student research associates as summer trainees, it invests a significant effort to educate the researchers of the next generation. The number of female scientists has increased and should increase further, including in leadership roles within the groups and the Center. These efforts will be enhanced also in the 4th mid-term.

Evaluation: Proper
