

# Evaluation of FY 2016 Operating Results for the National Institutes for Quantum and Radiological Science and Technology

August 2017

Minister of Education, Culture, Sports, Science and Technology

Nuclear Regulation Authority

1. Items related to the evaluation		
Agency	National Institutes for Quantum and Radiological Science and Technology	
FY for evaluation	FY evaluation	FY2016 (1st term)
	Mid to long-term objective period	FY2016- FY2022

2. Items related to the assessor			
The Competent Minister	Minister of Education, Culture, Sports, Science and Technology		
Incorporated jurisdiction dept.	Science and Technology Policy Bureau	Dept. and person in charge	Office for Quantum Science and Technology, Research and Development Infrastructure Division, Takashi Nishiyama
Evaluation and inspection dept.	Science and Technology Policy Bureau	Dept. and person in charge	Planning and Evaluation Division, Kenji Matsuoka
The Competent Minister	Nuclear Regulation Authority (co-jurisdiction over the effects of radiation on human bodies, prevention of harm to human bodies from radiation, and diagnosis, treatment and medical use of radiation among agencies' operation)		
Incorporated jurisdiction dept.	Radiation Protection Department, Nuclear Regulation Authority Secretary-General's Secretariat	Dept. and person in charge	Radiation Protection Department, Satoshi Sato
Evaluation and Inspection dept.	Nuclear Regulation Authority Secretary-General's Secretariat	Dept. and person in charge	Policy Planning and Coordination Division, Kazuhiro Ohkuma

3. Items regarding implementation of evaluation
<p>Opinion gathering and hearing from the National Research and Development Agency Council (hereinafter referred to as the "Council")</p> <p>According to the following procedures, a hearing was held about the evaluation documents related to FY2016 operating results of the National Institutes for Quantum and Radiological Science and Technology (hereinafter referred to as QST) in the Council of the Ministry of Education, Culture, Sports, Science and Technology and the Nuclear Regulation Authority.</p> <p>On June 23, 2017, the Council held a meeting of the QST Sub-Committee of the National Research and Development Agency Council (hereinafter referred to as the "Sub-Committee") to review the procedure/schedule of the evaluation regarding the operational results of the QST.</p> <p>On July 7, 2017, the Council held a meeting of the Sub-Committee of the Ministry of Education, Culture, Sports, Science and Technology, and conducted a hearing from the QST, and heard opinions from the members about creative research and development to search for seeds concerning quantum science and technology, research and development for the innovative medical use of radiation, and research on the influence of radiation, and radiation medicine, and research and development for the application of quantum beam, and research and development for nuclear fusion.</p> <p>On July 10, 2017, the Council held a meeting of the QST Sub-Committee (hereafter referred to as the "Sub-Committee") to hear opinions from the members about research on radiation safety and emergency exposure medicine. Also, the Council conducted a hearing from the QST.</p> <p>On July 21, 2017, the Council held a meeting of the Sub-Committee of the Ministry of Education, Culture, Sports, Science and Technology to hear opinions about creative research and development to search for seeds concerning quantum science and technology, and research and development for the innovative medical use of radiation, and research on influence by radiation, and radiation medicine, and research and development for the application of quantum beam, and research and development for nuclear fusion.</p> <p>On July 24, 2017, the Council held a meeting of the Sub-Committee of the Nuclear Regulation Authority together opinions from the members about evaluation reports on items of research on radiation safety and emergency exposure medicine.</p>

4. Important items and others relating to the evaluation
No special matters to note

1. Overall evaluation								
Rating*1 (S, A, B, C, D)	A	(Reference) Overall rating situation for the past FY years compared with the same period during this FY						
		FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
		A						
Reasons for rating	As shown in the overall evaluation of the agency as a whole, more progress of performance than expected in the mid to long-term plan and the FY plan is recognized.							

2. Evaluation of the whole agency	
○	With President Hirano’s clear vision and strong leadership on the concept of “Harmonic Diversity Creation,” the Agency very aggressively makes efforts to maximize R&D achievements as a new agency, such as <u>development of Future QST Strategy 2016, launch of the Future QST Laboratory and Strategic President Fund, establish innovation hubs, and conclude treaties with four heavy electric makers concerning the Quantum Scalpel Project, promotion of R&amp;D to exert integration effects, and promotion of efforts concerning the quantum life science.</u> These can be highly evaluated as efforts suitable for the “Agency that is expected to become a highly active corporation where leading-edge research and development worthy of being called quantum science and technology are always launched,” which was carried in the mid to long-term objectives.
○	In particular, the Agency <u>received the Hannes Alfvén Prize by the European Physical Society (EPS)</u> in recognition of the experimental and theoretical contribution of the QST to laser ion accelerators in the research and development for the application of quantum beam. This means QST's potential in this field was evaluated in the world and was a particularly conspicuous achievement. In addition, it is safe to say that not only <u>the high intensity laser research that achieved the world highest light-collecting intensity, which can be said to be a reason for this prize, but also the development of new methods of electron spin control in graphene, leading edge material, and the diamond nitrogen-vacancy center (NVC) formation/characteristic control process,</u> which can be developed into quantum computing/quantum memory are especially remarkable results, which are sufficiently promising to promote the future creation of scientific and technological innovations. Considering a fact that the Agency successfully publishes papers on magazines with impact factors, we want to highly evaluate these results.
○	It needs to keep in mind that that the research on influence by radiation, and radiation medicine and operating results of functions to be fulfilled by a public research institution have properties that results appear only after the accumulation of long-year’s researches. Such low-profile continuous researches of the Agency produced very important results such as <u>the quantitative evaluation of exposure methods on the influence of the likelihood of cancer and the development of X-ray CT dose evaluation system.</u> Continuously, we expect the Agency to keep on basic researches on radiation effects and trainings/preparation related to emergency procedures and based on the basic research and become a role model for medical institutes for exposure medicine.
○	In R&D for revolutionary medical use of radiation and the nuclear fusion, operational results in <u>radioactive agent development, the heavy particle beam cancer treatment, the ITER plan, and wide approach activities</u> are more than those stipulated in the mid to long-term and FY plans.
○	We expect the Agency to promote efforts to contribute to maximizing R&D achievements of Japan’s quantum science and technology research and development as the “world-class quantum science and technology research and development platform” aimed at by QST while making the best use of various systems launched in the first year and utilizing the PDCA cycle for further improvement.

3. Issues to be solved and /or improved for each subject	
•	To promote the fusion research among researchers in different fields, various measures are taken such as the establishment of the future laboratory and creative researches on the initiative of president. We recognize the outcomes are more than the plan, yet it is the first year since the creation. From the viewpoint of the creation of considerable achievements, it is necessary to see the progress of the future research progress. (See page 6)
•	In a new business, it is important to carry forward the proper rationalization without break from a long-term perspective. The future laboratory has been evaluated and reviewed within the year. We highly evaluate it. We hope the Agency will continuously do monitoring and pay attention to the turn around in the other system. (See page 6)
•	As for the Kids’ Science Museum of Photons, it is necessary to follow up investment effects. It is desirable to always monitor users' satisfactory degree in sharing of the facility such as the sufficiency rate and establish the PDCA cycle. (See page 142)

- There is about 1 year preparation period before the launch of the Agency. We hope people in the future can learn from the history based on lessons learned from effectiveness of this preparation. (See page 186)
- It is recognized that more than one system has started to function effectively for the organization. To maximize these results in and after the second year, the Agency should focus on the establishment of monitoring and PDCA cycle. (See page 186)

4. Other items	
Main opinions of the council on research and development	No special matters to note
Auditor's special comments	No special matters to note

\* 1 The evaluation is based on the “Standards for Evaluation of Incorporated Administrative Agencies under the MEXT” (determined by the Minister of Education, Culture, Sports, Science and Technology on June 30, 2015) and the “Guidelines for Incorporated Administrative Agency Evaluation” (determined by the Minister for Internal Affairs and Communications on September 2, 2014). The details are as follows.

S: Based on the National Research and Development Agency's aims, businesses with mid to long-term objectives due to comprehensive consideration based on some circumstances regarding the agency's business achievements, and efforts through its activities, especially the creation of considerable achievements, anticipated creation of special achievements in the future and so on toward “maximization of R&D achievements” under the conditions of appropriate, effective and efficient operations are recognized.

A: Based on the National Research and Development Agency's aims, businesses with mid to long-term objectives due to comprehensive consideration based on some circumstances regarding the agency's business achievements, and efforts through its activities, especially the creation of considerable achievements, anticipated creation of special achievements in the future and so on toward “maximization of R&D achievements” under the conditions of appropriate, effective and efficient operations are recognized.

B: Based on the National Research and Development Agency's aims, business with mid to long-term objectives due to comprehensive consideration based on some circumstances regarding the agency's business achievement, and efforts through its activities, a certain degree of expectation for the creation of achievement and creation of achievement in the future toward “maximization of R&D achievements” were recognized, and steady business operations have been also recognized.

C: Based on the National Research and Development Agency's aims, businesses with mid to long-term objectives due to comprehensive consideration based on some circumstances regarding the agency's business achievements, and efforts through its activities, the creation of achievements, further drastic efforts and improvements toward “maximization of R&D achievements” or “appropriate, effective and efficient operations” are anticipated.

D: Based on the National Research and Development Agency's aims, businesses, mid to long-term objectives and so on, as a result of comprehensive consideration based on some circumstances regarding the agency's business achievements, efforts and so on through its activities, special efforts and improvements including a fundamental drastic review, toward “maximization of R&D achievements” or “the appropriate, effective and efficient operations” are required.

Mid to long-term objectives (Mid to long-term plan)	FY Ratings							No. of document each item	Remarks
	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022		
I. Maximization of R&D achievements and quality improvements of other operations									
1. Medical R&D concerning quantum and radiological science and technology									
(1) Medical R&D concerning quantum and radiological science and technology Exploratory/creative R&D area concerning quantum science and technology	A							No.1	
(2) R&D area for revolutionary medical use of radiation	A							No.2	
(3) Radiation effects and exposure medical care research area	A							No.3	
(4) R&D area concerning the application of quantum beams (advanced quantum beam technology development and research on quantum beam science)	S							No.4	
(5) R&D concerning nuclear fusion (Spread and utilization of results, collaboration with external organizations, and functions to be fulfilled by a public research institution)	A							No.5	
2. Dissemination of R&D achievements by an intelligible method and promotion of utilization of outcomes	B							No.6	
3. R&D promotion through international cooperation and industry-academia-government collaboration									
4. Functions to be fulfilled by a public research institution									
(1) Functions to be fulfilled by a public research institution. Functions to be fulfilled as the central organization in measures for nuclear emergency, radiological protection, etc. (2) Contribution to reconstruction in Fukushima (3) Development of human resources (4) Promotion of utilization of facilities and equipment									
(Common to agencies) II. Measures to Be Taken to Achieve Objectives Concerning Operational Streamlining III. Budget (including an estimate of personnel expenses), an income and expenditure plan, and a funding plan IV. Important items related to business management and others	A							No.7	

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[Administrative and projects related to research and development (I)]

S: Based on the National Research and Development Agency's aims, businesses, mid to long-term objectives and so on, and as a result of comprehensive consideration based on some circumstances regarding the agency's business achievements, efforts and so on through its activities, especially the creation of considerable achievements, anticipated creation of special achievements in the future and so on toward "maximization of R&D achievements" under the conditions of appropriate, effective, and efficient business operations are recognized.

A: Based on the National Research and Development Agency's aims, businesses, mid to long-term objectives and so on, and as a result of comprehensive consideration based on some circumstances regarding the agency's business achievements, efforts and so on through its activities, the creation of considerable achievements, anticipated creation of achievements in the future and so on toward "maximization of R&D achievements" under the conditions of appropriate, effective, and efficient operations are recognized.

B: Based on the National Research and Development Agency's aims, businesses, mid to long-term objectives and so on, and as a result of comprehensive consideration based on some circumstances regarding the agency's business

achievement, efforts and so on through its activities, a certain degree of expectation for the creation of achievement and creation of achievement in the future toward “maximization of R&D achievements” were recognized, and steady business operations have been also recognized.

C: Based on the National Research and Development Agency’s aims, businesses, mid to long-term objectives and so on, and as a result of comprehensive consideration based on some circumstances regarding the agency’s business achievements, efforts and so on through its activities, the creation of achievements, further drastic efforts and improvements toward “maximization of R&D achievements” or the “appropriate, effective, and efficient operations” are anticipated.

D: Based on the National Research and Development Agency's aims, businesses, mid to long-term objectives and so on, and as a result of comprehensive consideration based on some circumstances regarding the agency's business achievements, efforts through its activities, special efforts and improvements including a fundamental drastic review, toward “maximization of R&D achievements” or the “appropriate, effective, and efficient operations” are required.

**【Other than administrative work and projects regarding research and development (After II)】**

S: Through the activities of a corporation, remarkable performance exceeding the intended objectives is recognized quantitatively and qualitatively in the medium-term plan (in terms of quantitative indicators, 120% or more vis-à-vis planned medium-term value (or planned FY value), and remarkable performance is also recognized qualitatively)

A: Through the activities of a corporation, remarkable performance exceeding the intended objectives is recognized in the medium-term plan (in terms of quantitative indicators, 120% or more vis-à-vis planned medium-term value (or planned FY value).

B: Performance exceeding the intended objectives is recognized in the medium-term plan (in terms of quantitative indicators, 100% or more but less than 120% vis-à-vis planned medium-term value (or planned FY value).

C: Performance falls below the intended objectives in the medium-term plan, requiring improved performance (in terms of quantitative indicators, 80% or more but less than 100% vis-à-vis planned medium-term value (or planned FY value).

D: Performance falls below the intended objectives in the medium-term plan, requiring drastic improvement of business including its abolition (in terms of quantitative indicators, less than 80% vis-à-vis planned medium-term values (or planned FY value), or it is recognized that the competent Minister is required to ask for improving business operations or taking other necessary measures).