

Integrated Safeguards Information System for Japan (ISIS-J) - Strengthening SSAC for enhancing confidence in compliance with safeguards obligations -

S. Iso¹⁾, N. Nishiyama¹⁾, S. Kumakura¹⁾, K. Takizawa¹⁾, H. Yoshida¹⁾, I. Kobayashi¹⁾, M. Kikuchi¹⁾
N. Kimura²⁾, T. Matsubara²⁾, S. Yatsu²⁾

1) Nuclear Material Control Center, Tokyo, Japan,

2) Ministry of Education, Culture, Sports, Science and Technology, Japan

Iso@jnmcc.or.jp

Abstract.

IAEA has stated the importance of enhancing cooperation with SSAC. Therefore, Japan has developed the Integrated Safeguards Information System for enhancing confidence in compliance with the national obligation under the safeguards agreement and the additional protocol. Japan already established the National System including national inspections with NDA and DA verification functions and evaluation of data obtained from national inspections and has maintained the National System of safeguards as a SSAC in accordance with the safeguards agreement. Nuclear Material Control Center (NMCC) is engaged in national safeguards activities as designated organization of national inspectorate and information treatment including safeguards data analysis.

Recently, purpose of IAEA's safeguards activities may shift to detection of proliferation based on plausible proliferation paths from detection of diversion by certain material accountancy measures. Major safeguards activities of IAEA have changed from quantitative aspects to qualitative them. As supplements for declining the quantitative measures such as the activities based on the safeguards criteria the IAEA would expect the SSAC functions for maintaining the activities of quantitative manners. Japan believes that the State's responsibility for enhancing cooperation between the National System and the IAEA must assure the confidence level of correctness and completeness of the State declarations with accurate and precise accountability as findings from SSAC. Japan has started the development of the strengthened and autonomous national system namely the Integrated safeguards Information System for Japan (ISIS-J) in order to fulfil our responsibility.

Japan would seek to improve quality of information including nuclear material accounting data as well as expanded declaration relevant to nuclear activities in Japan, and to increase abilities for explaining safeguards relevant events in Japan. The enhanced findings could include not only obligatory information by the safeguards agreement and the additional protocol but also technical evaluation results as certain technical evidences with the accuracy and precision level of the declared information by the national analysis, e.g., results of NDA and DA verification, statistical analysis by cross check of operators values with verification results, and confirmation of expanded declaration by open source information, such as technical documents and others.

Based on the enhanced findings, the IAEA could carry out advanced and innovative inspections by unattended surveillance system with remote data transmission and random scheduled inspection with unpredictability.

Japan would like to show the model of strengthen SSAC function for enhancing confidence under integrated safeguards.

1. Introduction

A state's system of accounting for and control of nuclear material (hereafter SSAC) is a fundamental tool for effective and efficient safeguards implementation. At the early days to effect the comprehensive safeguards agreement (hereafter CSA), the IAEA developed the guidelines for SSAC.[1] After the additional protocol (hereafter AP) came into effect and moving to the integrated safeguards, many official documents issued by the IAEA emphasize that cooperation between the IAEA and SSAC is an important element of safeguards activities under CSA as well as AP.[2] Updating of the guideline to improve the effectiveness of SSACs at State and facility level would be challenged, but not yet be finalized.

SSAC of the State with significant nuclear activities such as Japan needs to furnish the technical and analytical ability to perform nuclear material measurements to meet with their safeguards obligations. Japan believes that the main role of SSAC is to assure the correctness and completeness of state's declaration with national responsibilities.

Recently, due to obtain additional function under the agreement of AP, the IAEA has a further right to enhance the safeguards activities such as information analysis coupled with confirmation by the complementary accesses based on plausible proliferation path viewing at state nuclear activities as whole. Previous activity was quantitative verification based on material balance of nuclear material at a material balance area or a facility; however, current activities of the IAEA may be firstly taken information analysis in the headquarters. Qualitative activities of the IAEA have further strengthened than previous quantitative activities.

Originally, Japan established the National System including national inspections with NDA and DA verification functions and evaluation of data obtained from national inspections and has maintained the National System of safeguards as a SSAC in accordance with the safeguards agreement.[3] Nuclear Material Control Center (hereafter NMCC) is engaged in national safeguards activities as designated organization of national inspectorate and information treatment including safeguards data analysis.

In order to comply with international engagement relevant to safeguards and to increase reliability of state's obligation to the CSA and AP, Japan intends to make further improvement of National System's functions. National System must assure the confidence level of correctness and completeness of the State declarations with accurate and precise accountability as findings from SSAC. Japan has started the development of the strengthened and autonomous national system namely the Integrated Safeguards Information System for Japan (hereafter, ISISJ) by effective use of national verification system that could obtain accurate and precise technical accountability.[4]

2. Technical goals of ISIS-J

At the time of designing the ISIS-J, we set five technical goals shown in below;

2.1 Assurance for correctness of quantitative declaration with quality control mechanism

Japan has declared quantitative data relevant to material accountancy of nuclear materials such as inventory change reports, physical inventory lists and material balance reports based on the requirement from the CSA in timely manners. In order to increase the level of accuracy and precision of the data and to assure the correctness of the data, ISIS-J will confirm and evaluate consistencies among the data provided by the facility operators, national inspection results including results of NDA and DA carried out by national inspectors and results of statistical data analysis between operator's and inspector's data with quality control mechanism.

NMCC has started a trial use of quality control system from 2009 based on ISO 9001 standard. As for operator's information provision system, the Japan's authority (hereafter JSGO) and NMCC would carry out an audit of operator's accountancy system based on obtained results of consistency checks.

2.2 Increasing accountability of quantitative declaration with technical objectivity

NMCC has already carried out the SRD and MUF evaluations as well as NRTA analysis for bulk handling facilities in Japan as a domestic function. Up to now, declarations to the IAEA are based on legal requirement such as figures of the subjects in the material balance reports. When the certain discrepancy in evaluation results would be observed, ISIS-J would make account of reasons about the discrepancy with technical objectives to the IAEA, and JSGO and NMCC would take follow up for corrections with the IAEA.

2.3 Quality assurance of qualitative information relevant to nuclear activities

To increase the transparency of Japanese nuclear activities which are limited to peaceful use, more sufficient safeguards information than legal requirement would be provided effectively and precisely by the ISIS-J. The more sufficient safeguards information could include qualitative information such as expanded declaration by Additional Protocol. The expanded declaration will be submitted to the IAEA after being collaborated it correctness by compared with some open source information and satellite imagery.

2.4 Provision of supplementary information to assure for completeness of qualitative declaration

For further achieving completeness of qualitative information, ISIS-J provides open source information relevant to nuclear activities in Japan to the IAEA through the current JASPAS task. The open source information could be used by the IAEA as supplementary information to evaluate Japan's nuclear activities. Additionally, to response to IAEA question to information declared under the AP, ISIS-J would assist the JSGO to prepare a certain reply to the IAEA.

2.5 Seeking a possibility to make hierarchy between SSAC inspection and IAEA quality control inspection[5]

The IAEA would take modern activities for detection of undeclared materials and activities with information driven approach and other qualitative mechanism. However, the IAEA still have an obligation to maintain the activities of quantitative verification. Therefore the IAEA could positively use the SSAC function, because INFCIRC/153 provides the SSAC as a firm system relevant to provision of accurate nuclear material information to the IAEA.

The SSAC has an obligation to assure the quality of information to be declared from national authority with suitable evaluation with technical objectivity as findings of national system. Based on the findings, the IAEA has a possibility to take quality control inspections by appropriate combinations of system audits of national system that take due account of the technical effectiveness of the system by referring with remote monitoring system with unattended NDAs and independent randomly scheduled inspections with short notice manners for independent measurements and observations.

ISO 8402 provides a glossary of quality terms, such as 'Quality policy', 'Quality management' and 'Quality Audit.' Here, 'quality policy' corresponds to the State's engagement to international agreements. 'Quality management' should be covered to the activities of the SSAC by the national authority. In the case of ISO 9001 standards, 'internal quality audits' and 'inspection and testing' are suggested as 'quality audit'.

Regarding to relationship between the SSAC and IAEA, a conformation hierarchy of State's peaceful use of nuclear material could be set up not only 'internal quality audits' that are looked on activities of national inspection regime but also 'inspection and testing' that are looked on activities of IAEA's independent inspection.

3. Structural outline of ISIS-J

Structural outline of ISIS-J is shown in below;

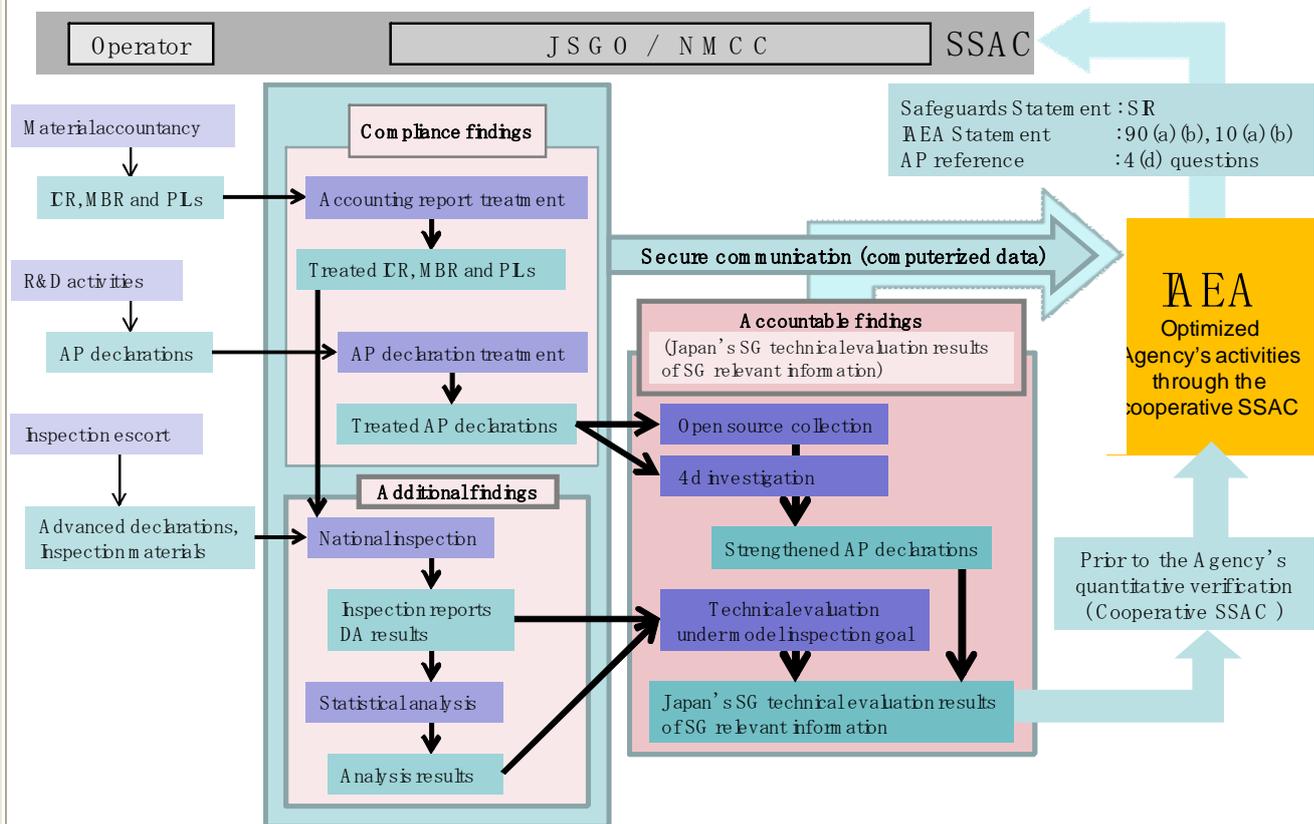


Figure -1 Structural Outline of ISIS-J

The preliminary computer system was introduced in order to integrate the accountancy data, inspection data and statistical analysis results. These data would be submitted to the IAEA through the secured network system that has already operated between the Operations A division of IAEA and JSGO.

4. Computer system and Data configuration of ISIS-J

The computer system which is used for summary of inspection results is needed for the consolidation with all safeguards information. It has already been started to establish some kind of computer system in Japan for generation of accurate material accounting report, statistical data analysis, inspection result report, DA analysis result summary and etc. Each computer system was developed under own purposes based on master plan for Japan's national system. To establish the computer system for ISIS-J in the first year of 2009, these three items mentioned below were taken into account.

The first is infrastructure for network security. All safeguards information should be treated in the network security. The second is hardware of the computer system with database to accumulate all safeguards information was installed in NMCC-HQ. The safeguards information in the database will be evaluated technically in accordance with inspection procedures automatically. The third is to establish appropriated material accounting report system that could be picked up from each material accounting report system to the ISISJ computer system. It is necessary for the technical evaluation to get some material accounting data of PIT date, inventory change date, amount of the inventory change and etc.

Data configuration of ISIS-J are shown in below;

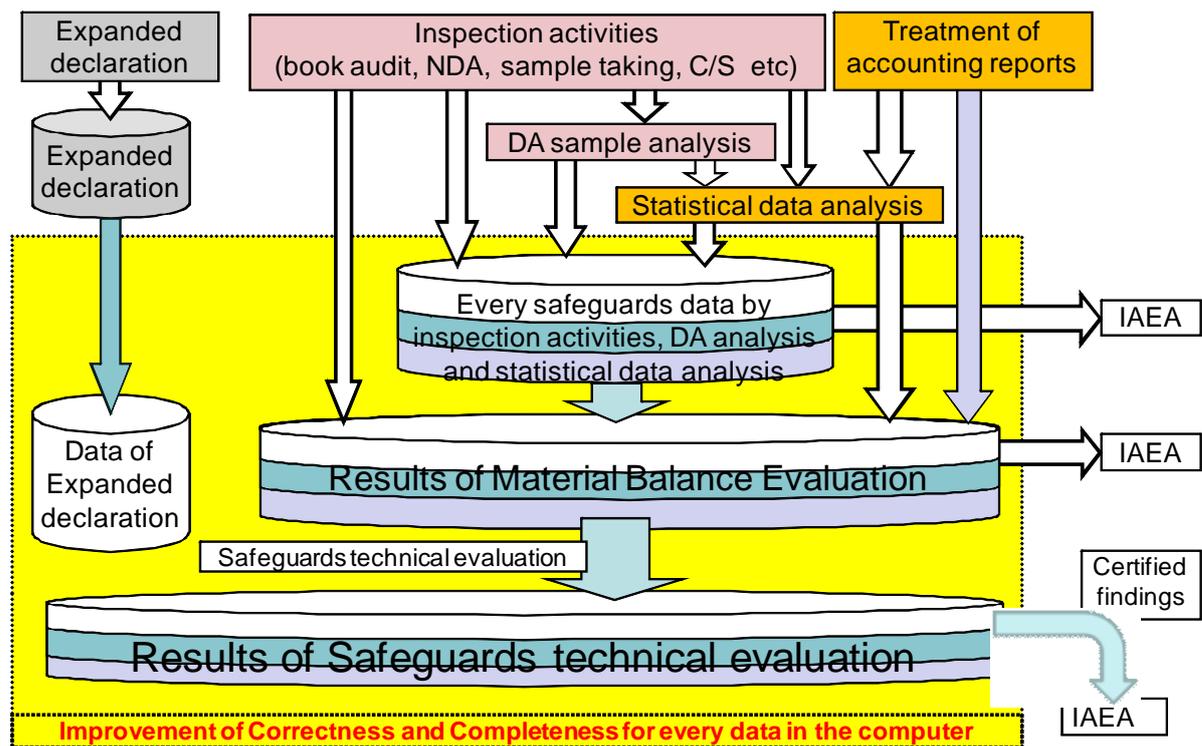


Figure -2 Data configuration of ISIS-J

5. Development Schedule

In the first year, ISIS-J has covered LEU fuel fabrication plant (LEUFF) and Light Water Reactor (LWR) with the technical evaluation. LEUFF and LWR have been applied to the IS since 2005, so that Japan's national system get good experience for the evaluation after the IS.

In the second year, ISIS-J is challenging to cover some Pu related facilities with the evaluation. The coverage of ISIS-J for the technical evaluation will be expanded to significant plants such as enrichment facility on the third year. The technical evaluation for every facility type in Japan will have been promoted for five years under step by step, and then ISIS-J will be improved continuously for Japan's safeguards to be cooperative Agency's safeguards.

Development schedule of ISIS-J is shown in below;

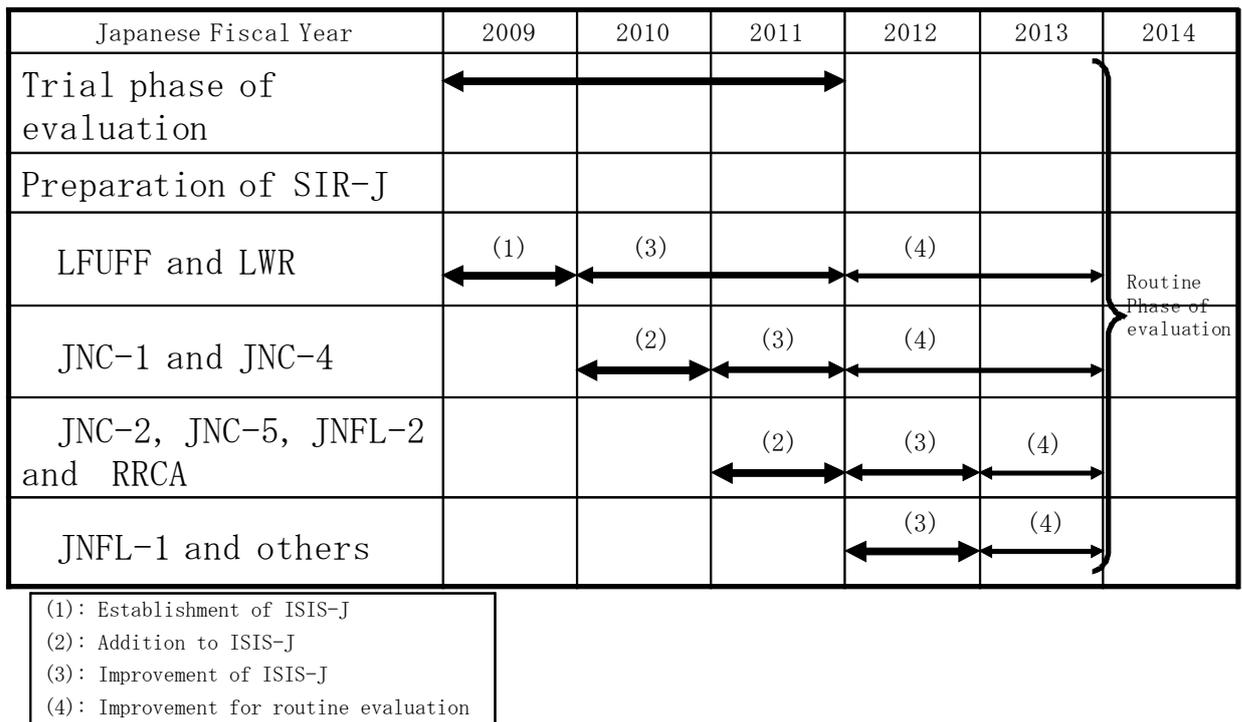


Figure-3 Development schedule of ISIS-J

6. Progress of works

6.1 Development of JAPAN'S SAFEGUARDS TECHNICAL EVALUATION GUIDELINE

Japan's national system tried to carry out safeguards technical evaluation for results of safeguards activities including Japan's independent inspection to assure the declaration quality including operator's material accountancy capability. Japan's safeguards technical evaluation guideline should be needed to examine inspection results with inspection goals, in order to confirm operator's material accountancy that could be achieved a satisfied level with technical accountability. ISIS-J drafted the Japan's safeguards technical evaluation guideline by referring IAEA SG criteria and Integrated Safeguards approach applied to the facilities in Japan.

The guideline was to be contents of 14 inspection goals like an IAEA SG criteria. In addition, implementation items in IS approach were sorted in accordance with them. The drafted Japan's safeguards technical evaluation guideline will have been promoted, because it is referred based on IAEA's current safeguards evaluation criteria that have object A, B and C as to detect undeclared material and activities, to detect undeclared production and to detect diversion.

The technical evaluation guideline would aim at enhancement of the correctness and completeness for all safeguards information with higher inspection quality and accountabilities. The guideline will revise based on our experiences; so that the Japan's safeguards technical evaluation guideline will be conducted in conjunction with the improved Japan's national system with findings of national system including accountabilities.

6.2 Evaluation Trials to LFUFFs and LWRs

A model evaluation based on the drafted guideline was implemented in 2009. In the first year, ISIS-J has covered LEU fuel fabrication plants (hereafter LEUFFs) and Light Water Reactors (hereafter LWRs) with the technical evaluation. LEUFFs and LWRs have been applied to the IS since 2005, so that Japan's national system get good experience for the evaluation after the IS.

6.3 Expansions of evaluation to other facilities

There are a variety of facilities in Japan than LEUFF facilities and LWRs. The additional facility-types

(JNC-1 site and JNC-4 site) will be added to evaluation scheme by the system. Especially, JNC-1 site approach is the big challenge for us. Some measures in the enhanced co-operation between IAEA and SSAC were already implemented under JNC-1 site approach, and it is good test case for the ISIS-J system to challenge an evaluation of complex facilities. It is necessary for us to identify the necessary information for the IAEA in order to qualify that Japanese findings are complete and correct.

MUFs and SRDs are important for evaluation of these facilities therefore Japan (NMCC) evaluates the data. Japan will identify reasons and will explain them to the IAEA, if necessary. This is an example of the accountability. The other example under JNC-1 site approach is the distractive analysis (DA) of the DA samples from Tokai Reprocessing Plant (TRP). Under JNC-1 site approach, Japan analyzes 100% DA samples taken from TRP and the IAEA analyzes 50% of them and uses the Japanese results of the other 50% after quality check (QC). The QC is as follows; 20% of the rest of DA samples, which are not analyzed by the IAEA, are analyzed by the IAEA. If the IAEA's results show that Japan's results of the same DA samples are good enough for using their evaluation, the IAEA uses the Japanese results for 50% DA samples, which are not analyzed by the IAEA.

For supporting the SSAC's DA results, additional activities, such as round robin analysis, are carried out but it is not clearly referred in the system or procedures. It is believed that this type of additional information is the important basis for the enhanced co-operation with SSAC of Japan.

7. Future Aspects of works

ISIS-J is the 5-year plan and the system will include the other facility-specific IS approaches and the future State-level approach for Japan. Through the development of the ISIS-J system, the important qualitative information should be identified and the information necessary for the quality check of the technical function of SSAC should be also identified.

Our final targets of ISIS-J are to enhance the co-operation with the IAEA and to provide more correct and more complete findings to the IAEA. They will contribute to increase the effectiveness and the efficiency of the IAEA safeguards system.

Concepts of cooperation between the Japan's SSAC and the IAEA are shown in below. Based on the concepts, ISIS-J will be improved and progressed.

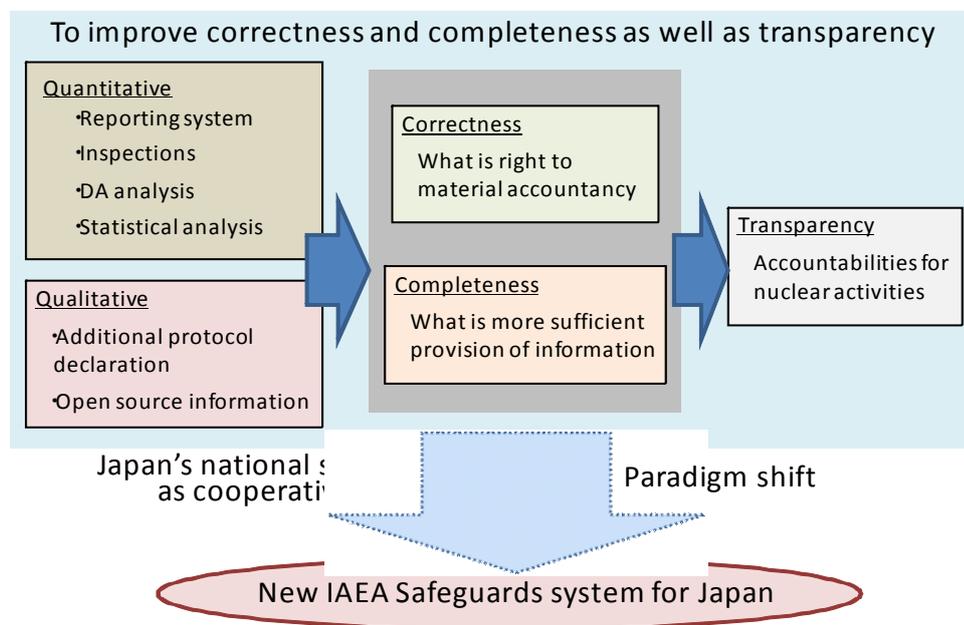


Figure-4 Future Aspects of ISIS-J

8. Summary

Through the effective use of ISIS-J, fruitful cooperation between the SSAC of Japan and the IAEA could be achieved. Summary of expectation through the ISIS-J is shown in below;

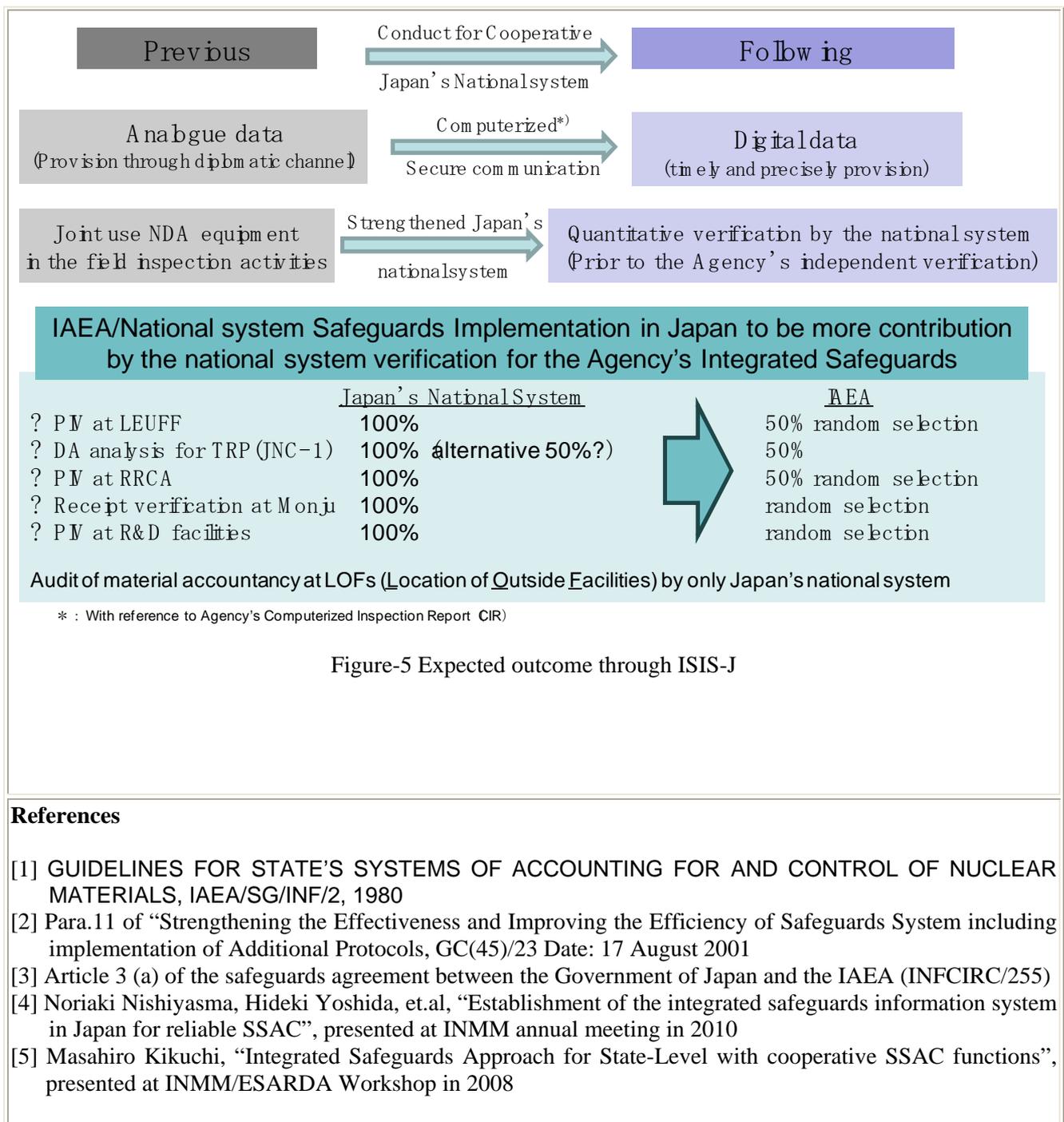


Figure-5 Expected outcome through ISIS-J

References

- [1] GUIDELINES FOR STATE'S SYSTEMS OF ACCOUNTING FOR AND CONTROL OF NUCLEAR MATERIALS, IAEA/SG/INF/2, 1980
- [2] Para.11 of "Strengthening the Effectiveness and Improving the Efficiency of Safeguards System including implementation of Additional Protocols, GC(45)/23 Date: 17 August 2001
- [3] Article 3 (a) of the safeguards agreement between the Government of Japan and the IAEA (INFCIRC/255)
- [4] Noriaki Nishiyama, Hideki Yoshida, et.al, "Establishment of the integrated safeguards information system in Japan for reliable SSAC", presented at INMM annual meeting in 2010
- [5] Masahiro Kikuchi, "Integrated Safeguards Approach for State-Level with cooperative SSAC functions", presented at INMM/ESARDA Workshop in 2008