

Reviewing Codes and Standards for Long Term Operation in Japan

Kenta Murakami¹, Taku Arai², Koji Yamada³, Kensuke Monma⁴, Takashi Tsuji⁵,
Nobuyuki Nakagawa⁶, Kunio Onizawa⁷

¹ The University of Tokyo, Tokyo, Japan (murakami@n.t.u-tokyo.ac.jp)

² Central Research Institute of Electric Power Industry, Kanagawa, Japan

³ Chubu Electric Power Co., Inc., Aichi, Japan

⁴ Tokyo Electric Power Company Holdings, Tokyo, Japan

⁵ The Kansai Electric Power Co. Inc., Osaka, Japan

⁶ Nuclear Engineering Ltd., Osaka, Japan

⁷ Japan Atomic Energy Agency, Ibaraki, Japan

ABSTRACT

This paper studied the future vision of codes and standards in Japan by systematically comparing Japanese regulatory rules, standards, and industry guides related to long term operation with international safety standards, and confirmed that the Japanese standard system generally meets their recommendations. The recommendation for the future improvements of Japanese codes and standards were summarized into following five items.

INTRODUCTION

Standard committee of the Atomic Energy Society of Japan (AESJ-SC) is leading Japan's practices on long-term operation (LTO) of the light water reactors through the establishment and the revisions of the "Code on Implementation and Review of Nuclear Power Plant Ageing Management Programs", so called PLM standard. While the latest revision of PLM standard, referring the new safety guides of the International Atomic Energy Agency (IAEA), several new concepts were discussed. For example, in light of the increasing number of plants shifting into the decommissioning phase, the need to define ageing management throughout entire plant life cycle was discussed. Furthermore, it was necessary to consider how probabilistic risk analysis should be incorporated into ageing management.

In order to implement these topics into codes and standards, the experts beyond the scope of current PLM standard were needed. Therefore, the AESJ-SC established a new LTO-task under their subcommittee to organize the relationship among standards and international practices, and have it report to necessary actions.

The objective of this paper is to briefly summarize their activities and share internationally the contents of the first phase of the LTO-task report.

ACTIVITIES

Phase 1 of the LTO task was conducted in 2020-2021. The members were the seven authors of this paper, with other observers participating. The following activities related to LTOs in Japan were identified and the relevant acts and regulatory standards, as well as standards and industrial guides were organized.

- Back-fit rule and its applications
- Facility management, which satisfies the regulation on technical standard and the operational rule
- Periodic operator inspection and its oversight by the regulator
- Sharing of operational experiences and other technical information
- Safety Improvement Review Report, which is a regulatory-required notification from the plant operator with some elements in Safety Analysis Report of the United States and Periodic Safety Review in Europe.
- Ageing Management Technical Evaluation, which required every 10 years after 30-years operation
- Extension of Operation Period beyond 40 years, with special inspection.
- Maintenance during extended outage periods

This information was compared verbatim with IAEA standards for periodic safety reviews, so-called SSG-25, and aging management, so-called SSG-48, to identify gaps in recommendations. Based on the discussions, the following five recommendations were compiled. The report is available in Japanese as meeting materials in the AESJ-SC.

RECOMMENDATIONS

Recommendation 1) Needs of integrated standards

In order to manage issues related to LTO in an integrated manner, there is a need for a standardized approach that can be referred to by a variety of stakeholders.

SSG-48 recommendations are dispersed among several standards, mainly the PLM standard by AESJ and “code/guide for maintenance” by Japan Electrical Association. There is also concern about the gap-term in the regulatory framework for long-term evaluation system. It is preferable to standardize requirements specific to aging management in terms of organizational structure, information sharing mechanisms, etc., in a manner that encompasses multiple standards.

Recommendation 2: Qualification of equipment throughout the plant lifetime

To qualify the equipment’s functions throughout the plant life, it is effective to bind standards for important system, structures and components (SSCs) and visualize their relationship

PLM standards focuses the identification of ageing mechanism and code/guide for maintenance deals with the framework of maintenance activities. However, there are no activities in Japan that are fully consistent with equipment qualification programs throughout the plant life. To fill this gap, It would be effective to summarize the approach for maintenance and evaluation of safety important SSCs, as well as the related codes and standards, referring to the ageing management program in some countries.

Recommendation 3: Integrated Risk-Informed Decision-Making (IRIDM) for LTO

Decisions for LTO should be risk-informed and be made in an integrated manner

Since aging management activities are defined dividedly in codes and standards, it is difficult to implement IRIDM to optimize risk reduction throughout whole plant life. Practical use of AESJ standard on integrated risk informed decision making and “proactive safety review guide” by AESJ, and the setting of safety goals for LTO is essential.

Recommendation 4: Preparedness for the Risk of Suspended Operation

It is effective to identify events that may cause long-term plant outage, and to prepare in advance basic measures for early restart.

When an external hazard or a trouble forces a plant to be outage for a long time and the restarting is not foreseeable, the plant is more likely to be decommissioned. For example, it may take long time to prove that there is no plastic deformation after an earthquake that slightly exceed the design basis. It may be useful to study the restarting experience after a big earthquake, such as Chu-etsu-oki and Great East Japan, and the experiences of stress tests.

Recommendation 5: Complementary use of technical documents

Active efforts is needed to make complementary use of the codes and standards developed by academic societies and the guides prepared independently by the industry or regulatory body.

Increasingly, Atomic Energy Association, as well as Nuclear Regulatory Authority, are developing their own guides for their own use. The role of guides, which are quickly developed to meet individual needs, is somewhat different from that of academic codes and standards, which can be used by a variety of stakeholders together. Since they are sometimes cited by each other, it is useful to have an overall picture of the documents available, including their revision policies.

FUTURE PLANS

LTO Task Phase 2 is currently underway to materialize the high-level recommendations described above. The results of this work will also be briefly presented in the presentation.

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