International Collaboration for Maintenance Science and Technology

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ABSTRACT

The paper discusses three key points; 1) expectation on enhanced capacity factor of currently operating Japanese nuclear power plant to move to low carbon economy, 2) international benchmarking on maintenance practices will benefit closing the gap with the global best practices, and 3) establishing component reliability database to assist countries with small number of nuclear power plants in their efforts for PSA and Reliability-Centred-Maintenance.

1. Introduction

Given the recent strong drive in Japan to the transition to low carbon economy, the Atomic Energy Commission of Japan released a policy paper on the Role of Nuclear Energy to the country's growth strategy. [1]

This paper estimates that around 1/3 of the proposed total reduction of GHG emission (by the Cabinet) to 2020 could be possible by enhancing capacity factor of currently operating nuclear power to more than 85% (1% increase of average capacity factor displaces CO2 emission by 3M Tons/Y) and by installing additional nine new nuclear power plants (1GWe plant displaces CO2 emission by 5M Tons/Y). The fact that nuclear power option is economically attractive and has significant reduction potential is clear from the evaluation of marginal abatement costs as compared with other power generation options. (Fig.1)

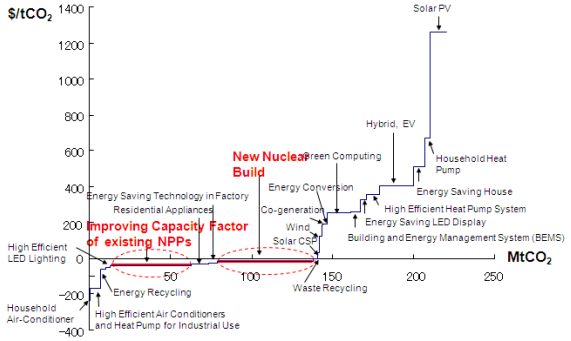

Fig.1 Marginal Abatement Cost evaluation in Japan [2]

2. Benchmarking for best practices

Nevertheless, a considerable efforts will be required to reach the de-fact global standard level of capacity factor of nuclear power plant. There is a need to benchmark for best practices in the world in operation/maintenance of NPPs and implement to take effect.

Table 1 shows an example of comparison between the US and Japan in terms of time required for maintenance and refueling outage and for restart of the plants forced to unplanned shutdown due to incidents. (Table.1)[3]

	Cycle Length (Months)	Shutdown Frequency (Event/Reactor-year)	Ave. Shutdown Period (days)	Ave. Inspection Period (days)	Plant Availability (%) MEDIAN
Japan	13.0	1.02	78	143. 5	71.6
USA	19.2	1.86	19	42. 3	91.8

Table.1 Comparison between US and Japan

The author, in cooperation with Dr. D. Chapin of MPR, discusses an example from the recent shutdown of a BWR plant in Japan to compare different practices between the US and Japan.

3. International cooperation in maintenance science and technology

Such benchmarking for best practices definitely is impossible without international cooperation. Further, benchmarking against practices of maintenance in other industries benefits as well. There has been a series of activities by the international organs (IAEA especially)

a) to address the strategies for competitive nuclear power in deregulated market since 1990's and to utilize the advent of technologies/methodology (Risk-informed approach, Reliability-Centred-Maintenance, Condition monitoring technique).
b) To share experiences and lessons learned, and
c) To establish database.

Further potential of constructing shared database for PSA and maintenance, by utilizing existing framework of PRIS (Power Reactor Information System of the IAEA) may further benefit. While recognizing issues of applicability of data to components of different design as well as of IPR, such database may include;

- Initiating event data
- Component failure rate data
- Component demand failure probability
- Surveillance test interval (STI) data
- Maintenance time (MTTR) data etc.

4. Concluding remarks

Implementation of best known practices after benchmark for best practices is crucial to maximize the benefit from the use of nuclear power, especially to enable shift to low carbon economy. International cooperation is must for benchmarking for best practices, Sharing LL, sharing database and further sharing resources. Sharing database for PSA and RCM through international organs would help countries with small nuclear power programme.

5. 4. References

[1] AEC report, 25 May 2010
[2] IEEJ report to AEC (23 April 2010)
[3] IAEA-PRIS data, 2007-9