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Expert Reviewer's Report (#2025-18)
Thursday, July 31, 2025

Dear Prof. Hase,

Thank you for the opportunity to contribute as a reviewer for the IEEE Milestone Program. Below, I provide my review of the Milestone Proposal: "Sakuma Frequency Converter Station, 1965."

1. Is the suggested wording of the Plaque Citation accurate?

Yes, I agree that the wording of the Plaque Citation is accurate and effectively conveys the historical significance and value of the achievement.

2. Is the evidence presented in the proposal of sufficient substance and accuracy to support the Plaque Citation?

Yes, the evidence provided in the proposal is both substantial and accurate in supporting the Plaque Citation. The following points are clearly demonstrated in the proposal and supporting materials:

- The Sakuma Frequency Converter Station was completed in 1965 by Electric Power Development Co., Ltd.

- The station enabled the first large-scale power exchange between Japan's eastern 50 Hz and western 60 Hz grids using a 300 MW mercury arc rectifier-based frequency converter.

- The achievement of the Sakuma Station addressed a long-standing national frequency division, improving grid reliability and resilience, and laying the foundation for Japan's future energy interconnection infrastructure.

3. Does the proposed milestone represent a significant technical achievement?

Yes, the proposed milestone represents several significant technical achievements:

Historically, the Japanese electric power system has been divided into two regions—eastern (50 Hz) and western (60 Hz) grids—a situation unique in the world. The 300 MW mercury arc rectifier-based frequency converter at Sakuma Station enabled the first large-scale, rapid, bidirectional power exchange between these two grids.

The core principle developed at Sakuma—interconnecting asynchronous grids while preserving regional independence—continues to shape Japan's modern power system, particularly in the context of increasing renewable energy integration and the need for enhanced grid resilience.

4. Were there similar or competing achievements? If so, have the proposers adequately described these and their relationship to the achievement being proposed?

Yes, the proposers have adequately described similar or competing achievements and explained their relation to the Sakuma Station. Unlike the HVDC technology used in Europe and North America, the Sakuma Station employed a frequency conversion system that coupled a 50 Hz synchronous motor and a 60 Hz synchronous generator on a common shaft to interconnect Japan's dual-frequency grids. This method enabled reliable frequency decoupling and rapid power reversal. The supporting infrastructure included specially designed transformers, control and protection systems, and acoustic measures to minimize environmental impact.

5. Have the proposers shown a clear benefit to humanity?

Yes, the proposers have clearly demonstrated the benefit to humanity. As a critical link in Japan's unique dual-frequency power system, the Sakuma Frequency Converter Station enabled real-time power balancing between eastern and western Japan. It has made a significant contribution to national grid stability and energy security, especially in providing mutual emergency power support during natural disasters such as earthquakes and typhoons.

Conclusion

As outlined above, the achievement represented by the Sakuma Frequency Converter Station has had a significant and lasting impact on the development of Japan's electric

power system. I strongly recommend that this proposal be approved and registered as an IEEE Milestone.

Sincerely yours,

Dr. Masayuki NAGAO
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CIGRE Distinguished Member