



February 5, 2024

Expert Reviewer's Report (#2022-19)

This reports an assessment for

Milestone-Proposal: "Toyota Prius, the world's first mass-produced hybrid vehicle".

1. Is suggested wording of the Plaque Citation accurate?

Yes. I support the content stated. The mass production of hybrid systems, which rely on precise control of the engine and electric motor to significantly improve fuel efficiency in automobiles, was a groundbreaking breakthrough at that time. The Prius has been widely accepted in society as an iconic eco-friendly car product.

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

Yes. The originality and effectiveness of the series-parallel hybrid system are clearly stated in the proposal and supported by the referenced literatures.

3. Does proposed milestone represent a significant technical achievement?

Yes. Toyota's developed series-parallel hybrid system connects the engine and the motor-generator through a planetary gear mechanism. This mechanism enables smooth shifting without a traditional transmission, similar to a Continuously Variable Transmission (CVT), while this requires precise coordination of the engine's output and the motor-generator through intricate control. Given the short development period at that time, it was necessary for conventional automotive engineers specializing in combustion and mechanics to closely collaborate with electrical engineers to devise control systems tailored to the characteristics of each unit and ensure a smooth-running vehicle. I believe that it was through the advanced collaboration between engineers from these different fields that this hybrid system was realized.

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

Yes. As mentioned in the proposal, hybrid technologies have been developed by other manufacturers as well. However, other companies used parallel hybrids, which added motors to the combination of a conventional engine and transmission, or added a clutch between the engine and motor to enable

motor-only operation. There was no other series-parallel hybrid that used a planetary gear system like Toyota's hybrid system. This system has been incorporated into many hybrid vehicles since then, indicating the high potential of the system developed at that time. Toyota's unique approach also includes the free licensing of patents related to components and controls that have been cultivated over more than 20 years since its launch, contributing the widespread adoption of excellent technologies.

Overall of the assessments above, I believe that the Toyota Prius described in this proposal is a very important product in the history of human technology, and I strongly recommend that this would be recognized as an IEEE Milestone.

A handwritten signature in black ink that reads "Makoto Iwasaki". The signature is written in a cursive, flowing style.

Professor Makoto Iwasaki, Dr. Eng.,
IEEE Fellow, IEE Japan Fellow, Member of Science Council of Japan (SCJ)
Department of Electrical and Mechanical Engineering
Nagoya Institute of Technology, Nagoya, Japan