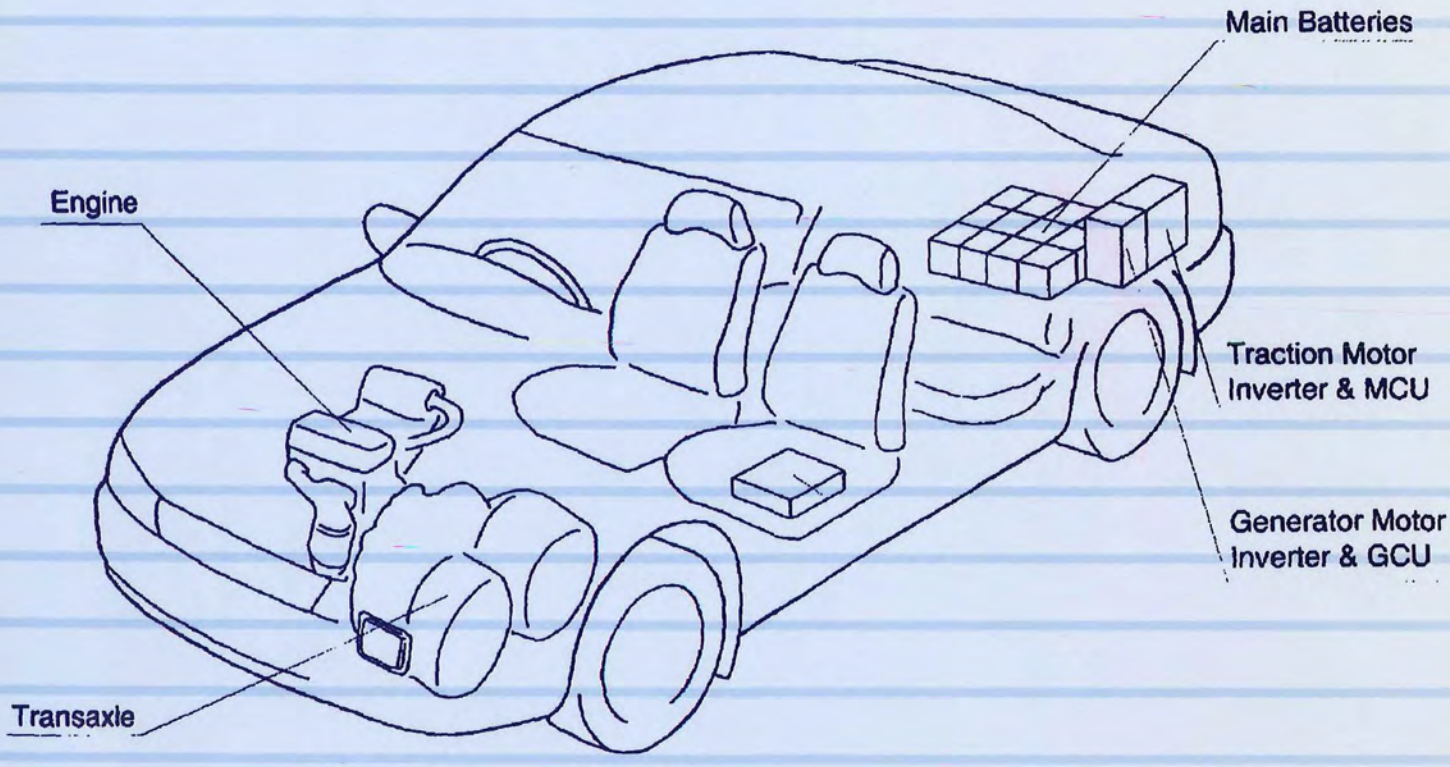
STRATEGIES IN

ELECTRIC AND HYBRID VEHICLE DESIGN



SAE SP-1156

TR-42

Strategies in Electric and Hybrid Vehicle Design

SP-1156

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Published by:
Society of Automotive Engineers, Inc.
400 Commonwealth Drive
Warrendale, PA 15096-0001
USA

ISBN 1-56091-786-5
SAE/SP-96/1156

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Printed in USA

PREFACE

Electric and hybrid vehicle technology is rapidly progressing worldwide in an attempt to lessen the air quality impacts of personal transportation and to reduce dependence on petroleum fuels. Strategies in electric and hybrid vehicle design seek to optimize vehicle performance, fuel economy, and emissions, and keep cost and complexity within consumer-acceptable limits.

This SAE special publication, Strategies in Electric and Hybrid Vehicle Design (SP-1156), is a collection of papers presented for sessions at the 1996 SAE International Congress and Exposition, co-organized by the Advanced Powerplant Committee/Powerplant Activity and the Electric Vehicle Committee/Passenger Car Activity.

One session, Engine and Fuel Technology for Hybrid Vehicles, focuses on engine and fuel strategies for fuel efficient, low emission hybrid vehicles. Hybrids employing either mechanical energy storage or electrical energy sources are covered. Longer-range concepts employing novel engines and hydrogen and compressed natural gas alternative fuels are also discussed. The reader will find that hybrid strategies taken by European, Japanese, and North American developers differ. While technology is evolving rapidly, it is clear that the definitive hybrid strategy has not yet been developed.

Strategies covered in the above session can be divided into three general classifications: series, parallel, and dual system (combined series-parallel). Each strategy places different demands on the engine. Typically, parallel operation, favored by the Europeans, has the advantage that the operation of the internal combustion (IC) engine is just as efficient as the operation of a conventional vehicle. However, the IC engine in a parallel arrangement must contend with transients. Controlling a parallel hybrid is critical, because each power source can provide traction to the wheels independent of the other system. Series operation has the advantage of allowing the engine to operate at a constant speed in the vicinity of its optimum (in terms of efficiency and emissions) operating point. However, the series configuration has an efficiency penalty, as energy must be converted several times. Dual systems appear promising because they have the advantages of both the parallel and series systems. It is hoped that this session will spark interest in research and development on engine systems tailored specifically for hybrid vehicle application.

Frank Stodolsky
Argonne National Laboratory

Session Organizer and Chair

Bradford Bates
Ford Motor Co.

Session Organizer

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