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**Sustainable Strategies in the Automotive Industry
Different Strategies between Car Manufacturers concerning HEV and
FCEV Development**

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Abstract

The automotive industry has been under considerable environmental pressure in the past years. Especially regulation in the United States, especially the zero-emission law in California and EPACT, has resulted in enforcement of R&D programs within big car manufacturers towards Alternative Fuel Vehicles (AFV). A range of alternatives for the internal combustion engine have emerged since then, some independent of IC-technology (Fuel Cell vehicles and Electric Vehicles), some building on existing IC technology (flexible fuel vehicles, hybrid vehicles). Given the pace of development of these AFVs by car manufacturers, there seems to be consensus within the industry a breakthrough towards AFVs will occur. It is uncertain however on what time scale AFVs will market ready, while consensus on the dominant AFV-technology seems far away, given the fare amount of different technological paths at the present time.

As a consequence, the roadmap of the future AFV is highly uncertain. The development and breakthrough of AFVs will depend on a large number of factors, for instance factors inherent to the technology (learning curves, economies of scale, technological characteristics) and factors related to strategies within the industry (coalitions, network development). Given the uncertainty of these developments, and the importance of propulsion technology for the industry, current developments in AFV raise questions concerning the firm's AFV-strategy: its perception of the future AFV market, coalition building with collaboration, as well as collaborations with complementary stakeholders (for instance fuel cell manufacturers, oil companies). In theoretical sense, the automotive industry represents an interesting case of strategic decision making in uncertain and high-risk situations.

This research focuses on describing the different strategies followed by several car manufacturers in the industry. It specifically focuses on Hybrid Electric Vehicles (HEV) and Fuel Cell Electric Vehicles (FCEV), currently seen as the most promising vehicle types. Based on literature review and interviews, technology strategies of several car

manufacturers on HEV and FCEV are identified, and compared with each other. Given the increasing role of FC-technology and battery technology, a special focus will be on networks established between automotive companies and companies in Battery technology and FC-technology.

The research presented in this paper aims to identify and compare automotive technology strategies in terms of differences in vehicle programs, expenditures in AFV, competence development, and networks developed. It is assumed that strong differences exist between car manufacturers, and by describing these differences in detail possible explanations in these competing strategies can be made. This research is a first step in a line of research, focusing on the different sustainable strategies between car manufacturers.