THERMOELECTRICAL ENERGY RECOVERY FROM THE EXHAUST OF A LIGHT TRUCK

Eric Thacher, Brian Helenbrook, Madhav Karri, and Marc Compeau

Clarkson University

Aleksandr Kushch and Norbert Elsner

Hi-Z Technology, Inc.

Mohinder Bhatti and John O'Brien,

Delphi Automotive Systems, Inc.

Francis Stabler

General Motors, Inc.

ABSTRACT

A team formed by Clarkson University is engaged in a project to design, build, test, and develop a plan to commercialize a thermoelectric generator (TEG) for recovering some of the energy in the exhaust from light trucks and passenger cars. The team members are Clarkson University (project management, vehicle inter-face design, system modeling, commercialization plan), Hi-Z Technology, Inc. (TEG design and construction, subcontractor to Clarkson), Delphi Automotive Systems (testing services and engi-neering consultation), and General Motors, Inc. (test vehicle).

Funds were supplied by a grant from the Transportation Research Program of the New York State Energy Research and Development Authority (Joseph Wagner, Project Manager). Members of the team and the U.S. Department of Energy's Office of FreedomCAR and Vehicle Technologies (John Fairbanks, Project Manager) supplied cost-sharing and in-kind support. General Motors loaned the test truck (a 1999 Sierra) and supplied information about its sys-tems. Delphi Automotive Systems, Inc., supplies engineering consulting services and will furnish 2 weeks of testing time at its Lockport, New York, facility.

The TEG consists of 16 HZ-20 modules connected in series, clamped between the ex-haust and coolant heat exchangers and elec-trically connected to the DC bus through a power-conditioning unit. It will be capable of generating 330 W of electric power when it op-erates at its design temperature differential. The exhaust from the test truck's 270 hp V8 gasoline engine passes through the two catalytic con-verters located near the left and right sides of the truck frame and then will be routed through the TEG. To provide for reliable thermoelectric module cooling, the TEG will be integrated into the truck engine cooling system.

This presentation will: (1) show some of the results of initial studies using a model that incorporates the TEG system into the National Renewable Energy Laboratory's ADVISOR ve-hicle simulation code, (2) discuss the principal conclusions of a market survey done for the project's draft commercialization plan, and (3) summarize the first portion of the Phase 2 work now underway.