DOE/CE/50389-1

"DIRECT-HYDROGEN-FUELED PROTON-EXCHANGE-MEMBRANE (PEM) FUEL CELL SYSTEM FOR TRANSPORTATION APPLICATIONS"

CONTRACT NO. DE-AC02-94CE50389

QUARTERLY TECHNICAL PROGRESS REPORT NO. 1

FOR THE PERIOD JULY 1, 1994 THROUGH SEPTEMBER 30, 1994

PREPARED FOR: U. S. DEPARTMENT OF ENERGY
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NOVEMBER 4, 1994

I. Introduction

This is the first Technical Progress Report for DOE Contract No. DE-AC02-94CE50389 awarded to Ford Motor Company on July 1, 1994. The overall objective of this contract is to advance the Proton-Exchange-Membrane (PEM) fuel cell technology for automotive applications. Specifically, the objectives resulting from this contract are to:

1) Develop and demonstrate on a laboratory propulsion system within 2-1/2 years a fully functional PEM Fuel Cell Power System (including fuel cell peripherals, peak power augmentation and controls). This propulsion system will achieve, or will be shown to have the growth potential to achieve, the weights, volumes, and production costs which are competitive with those same attributes of equivalently performing internal combustion engine propulsion systems.

2) Select and demonstrate a baseline onboard hydrogen storage method with acceptable weight, volume, cost, and safety features and analyze future alternatives.

3) Analyze the hydrogen infrastructure components to ensure that hydrogen can be safely supplied to vehicles at geographically widespread convenient sites and at prices which are less than current gasoline prices per vehicle-mile.

4) Identify any future R&D needs for a fully integrated vehicle and for achieving the system cost and performance goals.

II. Technical Progress Summary

Task 4.1 Conceptual Propulsion System Design (WBS 1)

Assumptions and vehicle parameters required for the initial propulsion system designed were reviewed with respect to power source and propulsion demands for a Proton-Exchange-Membrane Fuel Cell (PEMFC) system-powered automobile. Four vehicle types are being considered. Onboard hydrogen storage requirements (weight and volume) are factors in the initial design considerations.

Architectural layouts for the four vehicle types have been compiled and available volumes and dimensions have been calculated.

Task 4.3 Lightweight Fuel Cell Research and Development

Technical requirements for the deliverable PEMFC system for Phase I and Phase II were examined and reviewed with the potential fuel cell suppliers. The technical goals for Phase I PEMFC stack are: 10 - 12 kW power, weight density of $\leq$ 2.7 kg/kW (8 lbs/kW) at 30 psig and Pt catalyst loading $\leq$ 0.25 mg/cm^2.

III. Current Problems

The main problem has been the delay in consent for the award of subcontracts.

IV. Work Planned

Task 4.1 Conceptual Propulsion System Design (WBS 1)

Subtask 4.1.1 Propulsion Requirements and Trade Studies (Phase I)

Work will continue on the conceptual propulsion system design. The base vehicle representations and duty cycles in Ford's Corporate Vehicle Simulation Program (CVSP) will be used to calculate vehicle performance targets. Calculations will be made of preliminary fuel cell weight and performance characteristics using CVSP project vehicle range and performance.

Subtask 4.1.2 Architecture Layouts, Weights and Tradeoffs (Phase I)

The first draft of required weight, volume and geometry of the PEMFC system will be obtained from conceptual propulsion design results for the four base vehicles. The refinements of desired weight, volume and geometry for the PEMFC-powered vehicles will be made.

Task 4.3 Lightweight Fuel Cell Research and Development (WBS 3)

Work efforts will focus on improving the stack design from single cell units or from previously-constructed stacks in terms of performance and power density to achieve the stated goals for the Phase I PEMFC stack.

V. Schedule Status

Variance Analysis

Variances in the monthly Cost Performance Report (September) and deviations from the baseline activity schedule are due to the delay in the anticipated award of proposed subcontracts. As of this report date, consent has been received by Ford on 2 of the 11 subcontracts submitted to DOE on August 26, 1994.

Detailed Activity Schedule

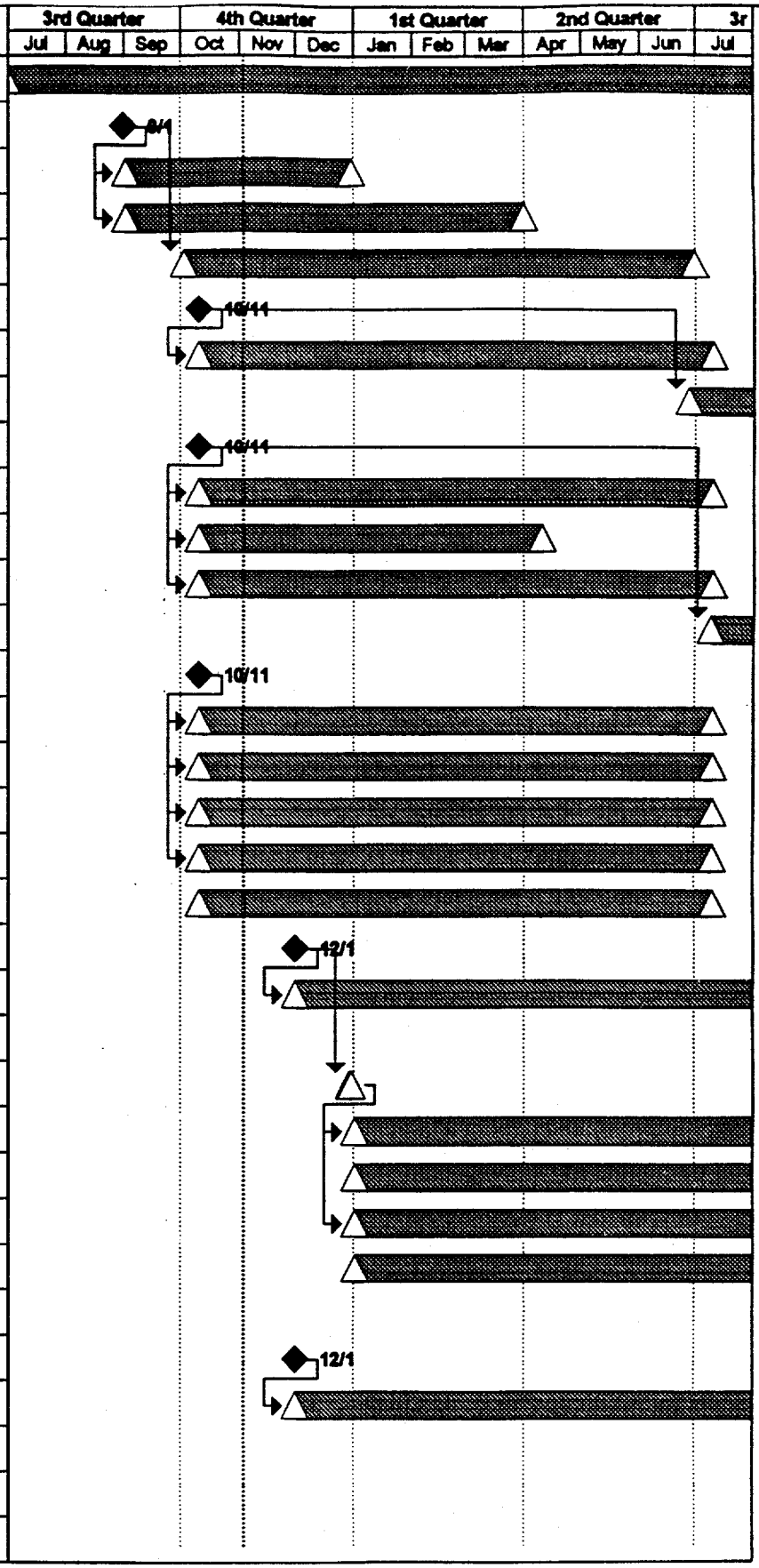
See Attachment I for the Detailed Activity Schedule.

Cost Performance Report

See Attachment II for the September Cost Performance Report.

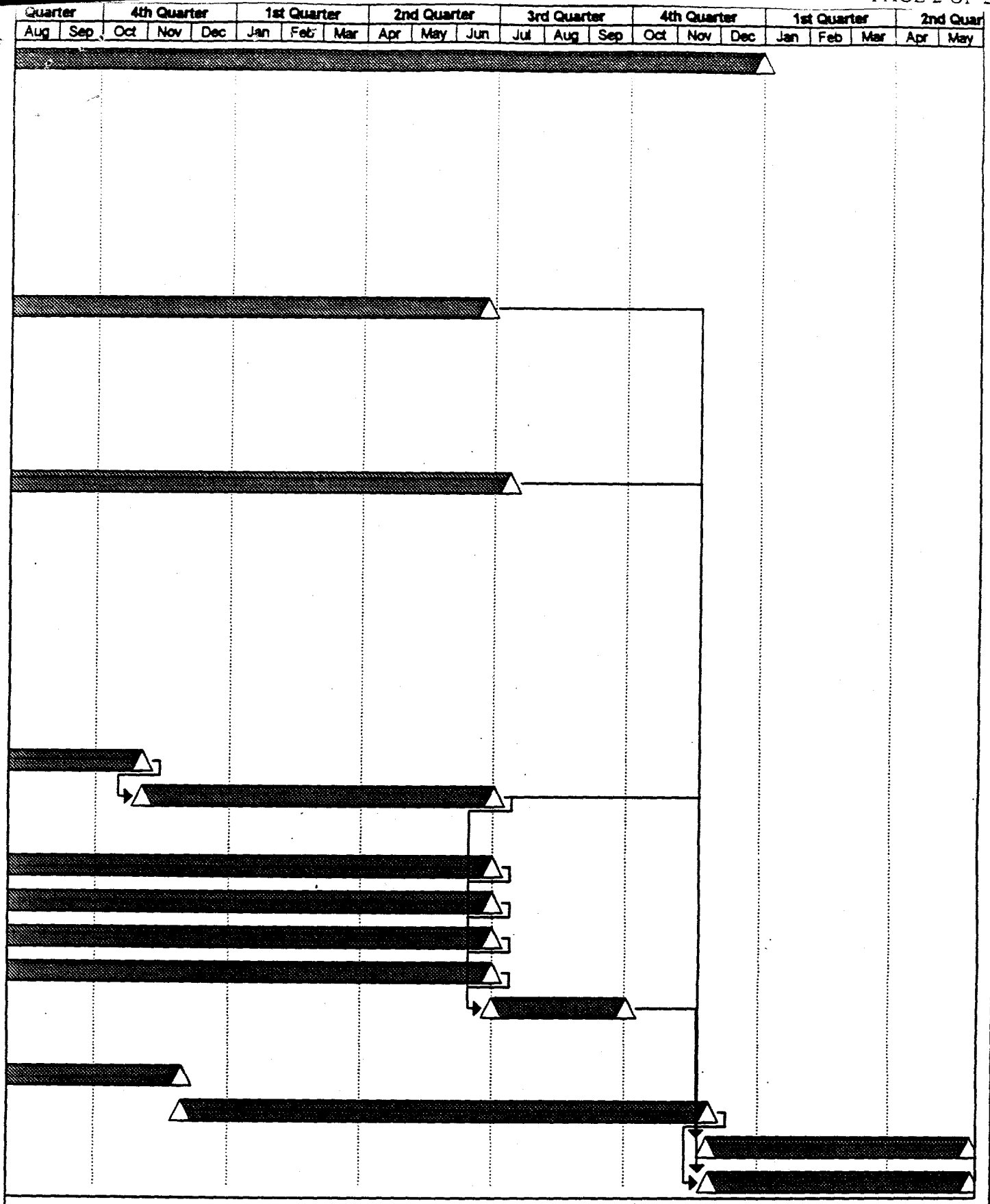
Signature of Principal Investigator: Georgianna Burnell for Sie Dei

ID	Task Name	Duratio	Start
1	PEMFC for Transportation	130.6w	7/1/94
2	Concpt.Propul.Syst.Desn.	0w	9/1/94
3	Propul.Reqmnts./Trade-offs	86d	9/2/94
4	Arch./Layout/Weight	30.2w	9/2/94
5	Tech.Econ.Compet.Goals	39w	10/3/94
6	H2 Fuel Reltd. R&D	0w	10/11/94
7	Onboard Storg.Analysis	39w	10/11/94
8	Storage Syst.Fabr.	52w	6/28/95
9	Safety Issues	0w	10/11/94
10	Hazards Analysis	39w	10/11/94
11	Rev.Histor.Data	26w	10/11/94
12	Public Percptn.H2	39w	10/11/94
13	Storg.Syst.Safety Tests	52.8w	7/10/95
14	H2 Infrastr.Studies	0w	10/11/94
15	Existing H2 Infrastr.	39w	10/11/94
16	H2 Genertn./Supply	39w	10/11/94
17	H2 Distribution	39w	10/11/94
18	Bulk Storage	39w	10/11/94
19	H2 Refueling	39w	10/11/94
20	Lt.Wt. Fuel Cell R&D	0w	12/1/94
21	R&D/Fab/Test 12 kW Naked	48w	12/1/94
22	R&D/ Fab/Test 50 kW PEMF	34.6w	11/2/95
23	Control/Ancil.Subsystems	0.2w	12/30/94
24	Fuel/Air React.Mngmt.	78w	1/2/95
25	Syst.Therm.Mngmnt.	78w	1/2/95
26	Peak Powr.Augment.	78w	1/2/95
27	Power Syst.Control	78w	1/2/95
28	Complete Pwr.Syst.Integrn.	13.4w	7/1/96
29	Full Funct.Pwr.Syst.Demo.	0w	12/1/94
30	Propul.Syst.Planning/Design	52w	12/1/94
31	Propul.Syst.Assmby./Shkdwn	52w	11/30/95
32	Integr.FC Syst.Test	26w	11/27/96
33	Prop.Futr.Devlpmnt.Plan	26w	11/28/96



Project: DOE/FORD Dir.Hydr.PEMFC
Date: 11/3/94

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress



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