PHILIPPINE ELECTRIC VEHICLE (PEV):
Development and Its Application To Urban Mass Transport

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Director, Mapua Alumni Liaison Office
Dean, School of Mechanical Engineering (Y2000-2006)
Mapua Institute of Technology
March 2007
PHILIPPINE ELECTRIC VEHICLE:
Development and its application to urban mass transport

Collaborative effort of the ff:

DEPARTMENT OF SCIENCE AND TECHNOLOGY:
  technical advisor and financing institution

PHILIPPINE ECONOMIC ZONE AUTHORITY:
  primary beneficiary

MAPUA INSTITUTE OF TECHNOLOGY:
  research and development

MR. ROMEO MARAVE:
  patent owner

ENG. ROEL JOHN C. JUDILLA
  PEV Project Leader
  Associate Professor, School of Mechanical Engineering
  Mapua Institute of Technology
PHILIPPINE ELECTRIC VEHICLE:
Development and its application to urban mass transport

OBJECTIVE:
To introduce a clean and sustainable urban mass transport service on a limited travel distance

SECONDARY OBJECTIVE:

- provide a reliable and cheap transport service
- provide support to local industry
- demonstrate to the society the positive effect of the synergy between the academe, government agencies and local industry

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To introduce a clean and sustainable urban mass transport service on a limited travel distance

Secondary objective:
• provide support to local industry
• provide a reliable and cheap transport service
• Demonstrate to the society the positive effect of the synergy between the academe, government agencies and local industry

SPECIFICATION:
• 80 KM distance coverage per 4 hour charging session
• 10 passenger capacity
• charging system is connected to a solar panel

70% of the PEV parts will be sourced out in the Philippines:

BODY AND CHASSIS:
Francisco Motors Phils

BATTERY:
Philippine Batteries Incorporated
Diliman, Quezon City

SAFETY GLASS:
Asahi Glass Philippines
Bo. Pinagbuhatan, Pasig City

WIRING HARNESS:
Yazaki – Torres Manufacturing
Singalong, Manila

TIRES:
Yokohama Tire Philippines Inc
Clark Special Economic Zone

SOLAR CELLS:
SunPower Corp
Laguna Techno Park, Laguna
PHILIPPINE ELECTRIC VEHICLE:
parts and components
**ENGINE COMPARTMENT**

- PEV is driven by a 1kw electric motor
- braking system is hydraulic type
- headlights, signal lights, brake lights, wiper and horns are also installed in the PEV
PEV CAB

- conventional steering system
- gauges for power consumption and for remaining battery power indicator
- vacuum pressure indicator for brake system
CARGO AND PASSENGER AREA

- PEV could accommodate 10 passengers or 500kg of load
PEV battery is charged by connecting it’s on board battery charger to any 220V AC power outlet.
TEST RUNS AND EVALUATIONS CONDUCTED:

CONTROLLED TEST ENVIRONMENT:
- Test area: Macapagal Hi-way
- Date of test: February 28, 2005
- Test duration: 6 hours
- video 1  video 2  video 3  video 4

ACTUAL ENVIRONMENT TEST:
- Test area: Mapua Institute of Technology, Intramuros, Manila
- Date of test: 2004 - 2005
- Test duration: at least 3 hours per day
<table>
<thead>
<tr>
<th>date of testing</th>
<th>28-Feb-05</th>
</tr>
</thead>
<tbody>
<tr>
<td>duration of entire testing</td>
<td>9:45 am to 245pm</td>
</tr>
<tr>
<td>actual time spend on testing</td>
<td>1 hour 15min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>km readings</th>
<th>power rating</th>
<th>actual km</th>
<th>location</th>
</tr>
</thead>
<tbody>
<tr>
<td>336615</td>
<td>10th level</td>
<td></td>
<td>mit</td>
</tr>
<tr>
<td>336709</td>
<td>9th level</td>
<td>28.2</td>
<td>macapagal</td>
</tr>
<tr>
<td>336792</td>
<td>10th level</td>
<td>24.9</td>
<td>MIT</td>
</tr>
<tr>
<td>336872</td>
<td>10th level</td>
<td>24</td>
<td>petron-macapagal</td>
</tr>
<tr>
<td>336892</td>
<td>10th level</td>
<td>6</td>
<td>test run macapagal</td>
</tr>
<tr>
<td>337172</td>
<td>2nd level</td>
<td></td>
<td>mit</td>
</tr>
</tbody>
</table>

Calibration run

<table>
<thead>
<tr>
<th>km reading</th>
<th>initial</th>
<th>.9km</th>
<th>3km</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>336901</td>
<td></td>
</tr>
<tr>
<td></td>
<td>final</td>
<td>336904</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>time to reach 100ft distance</th>
<th>time to reach 70kph</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st trial 10.4 secs</td>
<td>1st run 30.8 secs</td>
</tr>
<tr>
<td>2nd trial 10.6 secs</td>
<td>2nd run 38.9 secs</td>
</tr>
<tr>
<td>3rd trial 10 secs</td>
<td></td>
</tr>
</tbody>
</table>
## WORK PLAN

<table>
<thead>
<tr>
<th>No.</th>
<th>Objectives</th>
<th>Expected output</th>
<th>activities or workplan</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>a. to determine the appropriate type of power storage system which shall be</td>
<td>a. utilization, charging scheme and life cycle chart of a deep cycle and gel type</td>
<td>a.1 profiling of power utilization in braking, accelerating and decelerating and on</td>
</tr>
<tr>
<td></td>
<td>utilized in the transport mode of operation</td>
<td>batteries used in electric powered vehicles</td>
<td>crusing</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>a.2 establish optimum charging time for every type of battery</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td>a.3 establish power discharge profile for every type of battery and operation</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td>a.4 establish life cycle analysis for every type of battery base on the nature of</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td>operation</td>
</tr>
<tr>
<td>16</td>
<td>b. to determine the appropriate charging system and unit to synchronize with</td>
<td>b. optimized and customized charging unit for electric powered vehicles</td>
<td>b.1 design a charging unit for stationary and mobile power supply</td>
</tr>
<tr>
<td>17</td>
<td>the operation of the unit</td>
<td></td>
<td>b.2 design of environmental protection system for the charging unit</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>c. to develop a logic control for electronic switching to optimize the</td>
<td>c. profile of power utilization and charging based on the level of vehicle</td>
<td>c.1 design of logic control for optimization of charging system</td>
</tr>
<tr>
<td></td>
<td>power utilization</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What do we need from the industry or potential stakeholders?
Possible solutions:

a. Loan of equipment or model unit of the company’s product

b. Active participation (as technical expert to the project)

c. Financial assistance to the project

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Thank you...

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March 2007
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