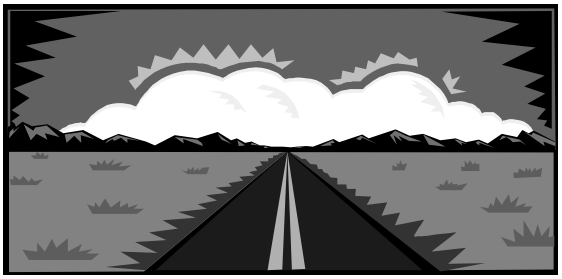
Proposal by the CEG Group for Fuel Cell Equipped Scooters in Taiwan



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Proposal Introduction

We are pleased to have the opportunity to respond to the request for proposal of Motorcycle for Fuel Cell Equipped Scooters in Taiwan, by T.G Tiger group. We definitely favor the use of a refueling station as a method of fuel distribution. We stand in agreement with the Electric Power Research Institute, the American Gas Association, the Gas Research Institute, and various federal agencies, that the stationary refueling system would be the preferred method of fuel distribution.

The first successful fuel cell device was a nickel electrode by Francis Bacon, an engineer of the 1930 s. He used nickel electrodes. In October of 1959, Harry Karl Ihring demonstrated a 20-horsepowered fuel cell tractor. Technology then transferred to the 1950 s when a federal agency called NASA began research to generate an electrical generator to provide power for upcoming space missions. This fuel cell technology would soon replace the too risky nuclear reactors, the heavy and short-lived batteries, and the cumbersome solar power. NASA funded more than 200 research contracts, into fuel cell technology. Since NASA is such a powerful pioneer in fuel cell technology, they have consented to serve as a great resource for training the most elect technicians and engineers. NASA has been funded 1 billion dollars in research and development of fuel cell technology.

The fuel cell method of choice seems to be the carbonate fuel cell, which uses internal reforming and is called the Direct Fuel Cell. The DFC is more efficient and economical than the phosphoric acid fuel cell. This surpasses technologies such as gas turbines, internal combustion engines, and steam turbines.

Our Company

Our company is called the CEG Group of companies. We specialize in alternative fuel technology. We have been in business for over twenty years and have trained technical expertise to fulfill your demands. In our group of companies, there are several departments including: research & development, engineering & design, testing facilities, product and process engineering, marketing, quality control and assurance, and manufacturing operations. All of our standards are in compliance with the United States Environmental Protection Agency regulations and ISO 9000 and 9002.

Taiwan Background

Taiwan, the seat of the Republic of China, lies in the western Pacific Ocean aside the Tropic of Cancer, less than 161 km (100 mi) from the southeast coast of mainland China, from which it is separated by the Taiwan (Formosa) Strait. To the NE, less than 129 km (80 mi) away, is the West end of the Japanese Ryukyu Islands (Kuo).
The economic stability of Taiwan has been at a constant change since the early 50 s. Since 1950, the government of Taiwan has created a series of economic plans to improve the economic increase of the country. The government first created a four-year economic development plan. The plans all resulted in an increase of the percentage of the products. The plans consisted of reconstruction and increased production of rice, fertilizers, and Hydroelectric power; it resulted in an increase of 36.6% in GNP and 17.4% in income capital (Kuo). After these plans went into affected, a six-year plan was introduced which added an emphasized an annual 7.5% growth in the service sector and a growth of new industrial productions such as high-technology dealing with computers, bioengineering, and robotics.

Taiwan has redirected their emphasis into the science and technology aspect of the economic sector. In 1970, Taiwan created its Science and Technology Development Program. This program seeks to encourage the development of knowledge-intensive industries (Kuo). Another program that has come into existence is the Technology Research Institute, which developed the transfer of different technologies through manufacturing and other various industries. In today s 20^{th} century there are a lot of innovations that are coming into existence. One innovation that is coming into play is the creation of fuel cell motorcycles and fuel cell scooters. Fuel cells are slated to reach $1.3 billion by 2003, up from an estimated $355 million in 1998-an annual growth rate of nearly 30%(Fuel Cell Technology News). Fuel Cells will have a tremendous impact on the economy in every industry from motorcycles to computers.

Justification for Fuel Cell technology

Fuel cells are electrochemical engines that produce electricity from paired oxidation/reduction reactions. They are like batteries with flows of reactants in and products out. In fuel cell, hydrogen and oxygen are combined to form water and electricity is produced. The CEG Group specializes in the seven types of alternative fuel cells which includes: phosphoric acid, proton exchange membrane, molten carbonate, solid oxide, alkaline, direct methanol, regenerative, and carbonate fuel cells. The fuel cell method of choice seems to be the carbonate fuel cell, which uses internal reforming and is called the Direct Fuel Cell. The DFC is more efficient and economical than the phosphoric acid fuel cell. This surpasses technologies such as gas turbines, internal combustion engines, and steam turbines. It is recommended by NASA that the carbonate fuel cell proves better than the proton membrane exchange fuel cell even though it is still in its experimental stages. For this reason, our proposal is directly centered on the Proton Exchange Membrane fuel cell technology.

Fuel cells have the advantage of high efficiency, low or zero pollution, quiet operation and fewer moving parts — only pumps and fan to circulate coolant and reactant gases for greater reliability than internal combustion engines.

Fuel Cell Technology is environmentally friendly. Fuel cell operates like a battery. Unlike a battery, fuel cell does not run down or require charging. The energy produced is in the form of electricity and heat. The emissions from the fuel cell system are much smaller than emissions from fuel combustion processes.

The current market is about $218 million and it s expected to increase to $2.4 billion by 2004 reaching $7 billion by 2009 according to studies by the Business Communications Company.

The fuel cell technology makes a country independent from the cyclical nature of oil imports. Reports show a tremendous dependence on vehicles as a mode of transportation. Passenger vehicles probably consume more than one million barrel of oil per day. This is an exorbitant amount for a developing country such as Taiwan.

Thus, fuel cell motorcycles could reduce urban air and noise pollution, decrease oil imports, reduce trade deficits and produce jobs for the Taiwanese economy. Fuel cell motorcycles operating from hydrogen from a renewable source will emit nothing but water vapors.

Relevant Transportation Information

There are about 100 million motorcycles in use in the world today. Of these, the greatest number is in Asia. Therefore, the proposal to develop fuel cell motorcycles or retrofit existing ones for more energy efficient usage will have a major impact. A brief breakdown of worldwide usage of motorcycles is as seen below:

Country	Motorcycles	% of total Vehicles
China	3,047,520	41.2
Hong Kong	17100	5.0
Japan	18,451,300	26.0
USA (1991_	6,830,000	3.7
Taiwan (1991)	9,232,889	73.4

In 1994, the Taiwanese motorcycle industry included 418 assemblers and manufacturers of parts. There were 16,000 employees in this industry. The revenues total $2.4 billion and domestic production reached $3.2 billion.

In Taiwan, the air pollution is a major problem. Taiwan is a small country with an area of 35,873 km^2 and 400 km long. Thus, significant air pollution is caused by industry, diesel-powered vehicles and two-wheeled two-strokes scooters.

Taiwan has a high fraction of scooters in its vehicle fleet. It is one of the top six scooters producers in the world.

Therefore, Taiwan can afford to spend on new ideas and modes of transportations. A hydrogen fuel cell motorcycle will offer reduced air pollution benefits and many more. Hydrogen motorcycles could be cheaper to drive than combustion engines.

Joint Venture

Our company s joint was formed as a liability company. The total capital is comprised of 30% equity, 40% cash and 30% debt, which is raised through loans from international banks, investments, firms, and investors. Since we are financially sound, we propose to seek about 40% of the shares. Our contribution to the capital will be 18% of total capital.

We currently have a partnership with Exxon-Mobil to convert ten to twelve gasoline stations to hydrogen fuel cell stations in Taiwan.

Managerial Structure of Joint venture

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Technical specifications

Specifications and Cost analysis

Part	Description	Pure FC (5.9 kW)	Hybrid (3.2 kW)	Hybrid (1.2 kW)	Zinc-air Hybrid
FC stack	DTI model; long-term cost	$220	$165	$135	
Starter battery	Yuasa-Exide	$10			
Hydrogen storage	DTI metal hydride model; long —term cost	$190	$200	$215	
Storage batteries	Zinc-air, 4.4 kWh				$430
Heat exchanger	Lytron M10-080			$30	
	Lytron M14-120	$60	$60		
Coolant pump	Generic	$10	$10	$10	
Blower for 1-2psi	Ametek 116628-E	$110	$110	$110	
Plumbing	Water, air pipes	$50	$50	$50	
DC brushless motor	UQM SR121/1.5L	$125	$200	$200	$175
Controller	UQM CD05-100A	$150	$150	$150	$150
Peaking battery	Bolder lead-acid	-	$195	$340	$285
Vehicle shell	Body and misc. parts	$295	$295	$295	$295
	TOTAL	$1,220	$1,435	$1,530	$1,335

The pure fuel cell produces more energy (5.9 kW) than the hybrids providing a more economical, durable, and environmentally friendly product. Due to the advances in fuel cell technology, the pure fuel cell currently sell for approximately $150 per kilowatt, while peaking power battery sell for as high as $3500 per kilowatt.

The pure fuel cell modification, for use on the Growl 50cc scooter proved to be cost effective and exceeded the following specifications:

Engine — 2 stroke, single cylinder, air cooled
Compression Ratio — 7.2:1
Displacement — 49.26 cc
Bore x Stroke — 40 x 39.2 mm
Max Horsepower — 5.0 hp/6000rpm
Max Torque — 0.70 kg-m/6000rpm
Maximum Speed — 75 km/hr
Fuel Consumption — 65 km/l
Ignition — Electronic CDI and variable timing

Legal issues

Some of the legal issues enforced were related directly to the emissions of scooters produced in Taiwan. They were implemented to reduce air pollution in the environment. The traditional two stroke and four stroke engines were producing a high volume of hazardous chemicals in the air. The government has put several laws and policies in place to minimize this problem. The Thailand motorcycles have been restricted to exceed certain speed limits. In 1991 Taiwan administered a mandatory catalytic converter for two stroke engines. The Taiwanese government has issued an inspection and maintenance standard. Later, an annual sticker system was implemented forcing motorist to test scooters. A government policy was defined that required 2% of the scooters fleet to be zero-emission scooters by the year 2000. From 1999 to 2002 a 115 million-dollar Electric Motorcycle Development Action Plan will be funded by the government to promote Electric Motorcycle Cell Technology and to reduce the amount of hazardous chemical air pollution.

The CEG Group abides by the ICC International Code of Direct Selling. We follow the well-established policy of the ICC of promoting high standards of ethics in marketing via self-regulatory codes intended to complement the existing frameworks of national and international law. The Code, which was first issued in 1978, is an expression of the business community's recognition of its social responsibilities in respect of commercial activities and communications.