# CleanTek's proposal

For fuel cell equipped scooters in Taiwan

*TEAM E*

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# 1 ABOUT US

## 1.1 MANAGERIAL TEAM

**A dedicated team at the cross-road of High technology and environmental protection**

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**Mr. Anthony CALBIOCH**

*Research and Development Manager*

**Mr. Olivier PERROUD**

*Production Manager*

**Mr. Rémi DUPONT-ROC**

*In charge of partnerships*

**Mr.Olivier POLES**

*Financial advisor*

**Ms. Rougiétou TOURE**

*Legal and environmental Advisor*

**Ms. Florence LOSTE**

*Human Resources Manager*

## 1.2 History

***CleanTek*** was founded in 1960 by a group of 6 partners, to further the scientific investigation of the physics and chemistry of amorphous and disordered materials and to engineer new materials and develop products using those materials. Our firm started over as a start-up, with the activity of selling components for motors to vehicle manufacturers. Our firm then specialized in the manufacture of fuel cells. We are leaders in France and the third firm in Europe. We actively involve ourselves into the ecological movement, which leads to the universal use of "clean" energy. The company has successfully developed a range of technologies including both products and advanced manufacturing processes primarily within the fields of energy and information processing. Commercialisation of ***CleanTek*** proprietary technologies has proceeded through licensing agreements.

**CleanTek plant**

***CleanTek*** now holds patents for car fuel-cells, motorcycles fuel-cells, trucks and buses fuel-cells, covering basic material compositions, product applications, and manufacturing processes. These patents, coupled with more than thirty years of accumulated background know-how in the field, represent powerful intellectual assets that form the basis for ***CleanTek*** many licensing agreements and manufacturing partnerships.

The research and product development staff at ***CleanTek*** and its subsidiaries and joint ventures publishes extensively in the technical literature, and their efforts are focused on the development of new products and technology that will benefit ***CleanTek*** commercial partner.

## 1.3 Our policy

Our activity is linked to our environmental policy.

The congestion of urban traffic in French big cities is actually a public health problem, and finding a durable solution is part of vehicles manufacturers responsibility. Emissions from over 200 million cars, trucks, and buses on the road in Europe account for about half of all air pollution in Europe., and for more than 80% in major urban areas.

Because of the dramatic increase in the number of vehicles and the number of miles driven, motor vehicles are still responsible for over 60% of the carbon monoxide (CO), and about one-third of the volatile organic compounds (VOCs). Since the 60's, governments have regulated air pollutants in the exhaust of cars and light trucks, and has regulated the emissions from heavy-duty vehicles since 1990. These regulations have resulted in emission levels per vehicle-mile driven falling by about 80% since 1970.

As the firm developed in response to the market study, and in accordance with the law, our department for research and development started working on the fuel cells project.

What is needed is a clean, efficient vehicle that provides the consumer with all the performance and convenience of today's automobile while reducing our dependence on oil. Fuel cell vehicles are now being developed in more and more countries, and will soon be available to meet this challenge.

Consequently, the activity of the firm soon got converted for 100% fuel-cell manufacture

As the main difficulty was to develop a stable and a safer combustible, the manufacturing of methanol fuel-cell can be considered as the best answer to the security issue.

Methanol, a liquid fuel made from natural gas or renewable biomass resources is a leading candidate to provide the hydrogen necessary to power fuel cell vehicles. The technical feasibility of using methanol fuel cells in transportation has been demonstrated in transit buses. The effects on the environment are:

- Air quality: no solid particles in suspension, or smoke
- The security of the energy used.
- Transportation of greater proportion of energy with minimum loss in a corrosive environment

Nevertheless, some difficulties have to be overcome in the future, such as dirt in cells after use, or storage problem.

## 1.4 Strategy

Our strategy is declined in 2 parts:

- Commercial based
- Relationship based

### 1.4.1 Commercial Strategy

Our goal is to convince vehicle manufacturers, and also to help them elaborate their commercial strategy towards their customers.

It is obvious that with the transportation sector almost completely reliant on oil, future availability and possible price shocks are major policy concerns. So we're also working with the government in order to promote the extension of the use of fuel cells vehicles.

The commercial strategy highlights the advantages of using fuel cells on the environment and on the economy through two points:

- Hydrogen is Environmentally Friendly.
- Hydrogen is Renewable and Sustainable.

### 1.4.2 Our strategic relationships

We have agreed to establish joint ventures for the continued development and commercialization of advanced energy technologies.

We collaborate with car, trucks and buses manufacturing companies, in order to improve the fuel-cells, and all the services linked to it, including after-sale services. *Our partners : Texaco, Mercedes, Peugeot, Mercedes.*

## 1.5 Activity

Since the creation of the firm, the activity moved from the production and selling of components for vehicle engines to the production and selling of fuel cells exclusively. Now the activity has extended to the manufacture of methanol fuel cells.

***CleanTek*** has maintained a strong core competence in materials research and advanced product development throughout its history, and the company protects the results of these efforts through an extensive collection of patents.

## 1.6 Products

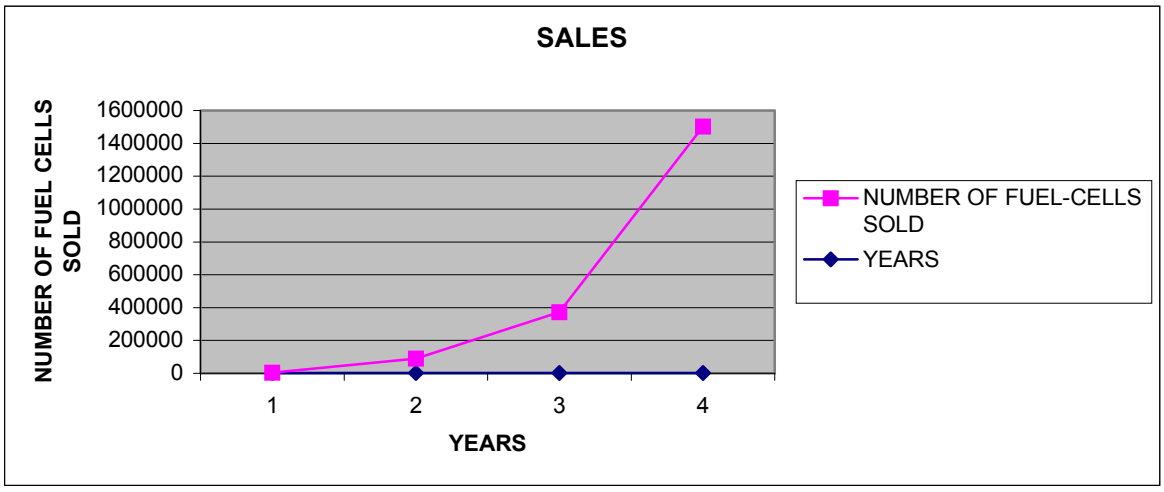
Hydrogen and methanol fuel cells, designed for our clients' vehicles. Our product main characteristic is that it is flexible. In that mean, it is refillable, it doesn't require a lot of changing to adapt to any standard of vehicle. The technical feasibility of using methanol fuel cells in transportation has been demonstrated in transit buses, and by 2004, or sooner, it is expected that a variety of cars and trucks in the U.S. and worldwide will be operating on methanol fuel cells.

The commercialization of methanol-powered fuel cells will offer practical, affordable, long-range electric vehicles with zero or near-zero emissions while retaining the convenience of a liquid fuel.

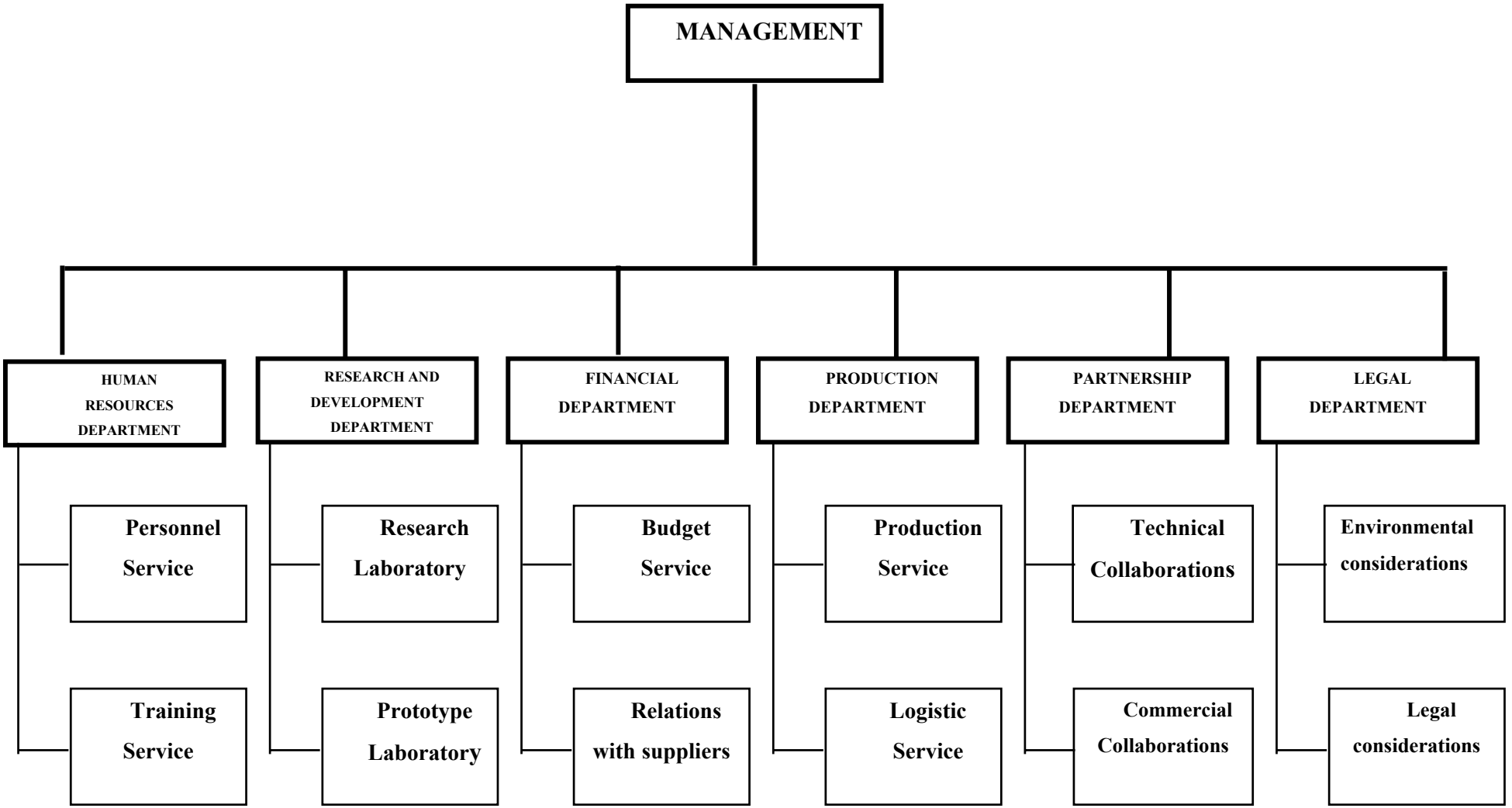
## 1.7 Clients

Our clients are : car, trucks and bus manufacturing companies. In the car manufacturers, taxis companies represent the largest part of our clients.


This graph shows that the most important customers are public transports vehicles manufacturers.




For the moment, the use of methanol fuel cells is limited in terms of diversity of client. We notice that the growth is slow but steady. An information campaign has started at the same time as the fuel-cell manufacture.




**CLEANTEK ORGANIZATION CHART**

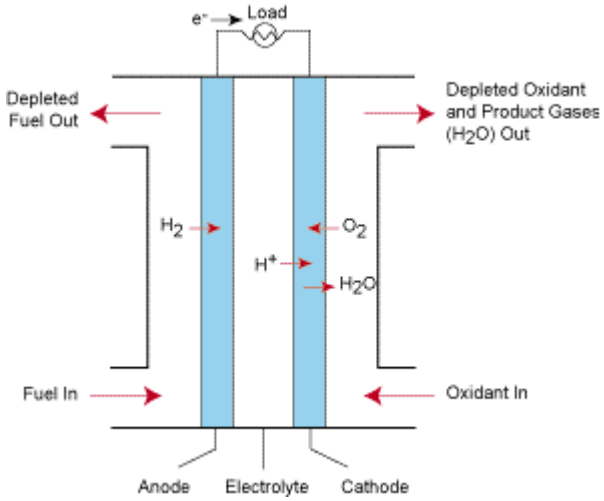
# 2 OUR TECHNICAL PROPOSAL

## 2.1 Foreward

As the background of our firm showed you, we have conceived fuel cells for a long time. Our last technical innovation concerns the design and the adaptation of a new fuel cell for scooters. For this application we decided that the price would be very important so, we have used low cost materials. Our fuel cells work with methanol because it is steady and enough energetic.

## 2.2 The chemical functioning of the fuel cell

To show this, we can use a diagram:




On this diagram, the word hydrogen means the source of hydrogen for the fuel cell, so the methanol in this case.

The chemical equations are:

On the cathode: $6H^+ + \frac{3}{2}O_2 \rightarrow 3H_2O$

On the anode: $CH_3OH + H_2O \rightarrow CO_2 + 6H^+ + 6e^-$

Consequently the overall reaction is:

$$CH_3OH + \frac{3}{2}O_2 \rightarrow CO_2 + H_2O$$

We can notice that, because of the apparition of carbon dioxide, we have to use an acid electrolyte, to neutralize it.

## 2.3 Technical characteristics of our fuel cell powered scooters

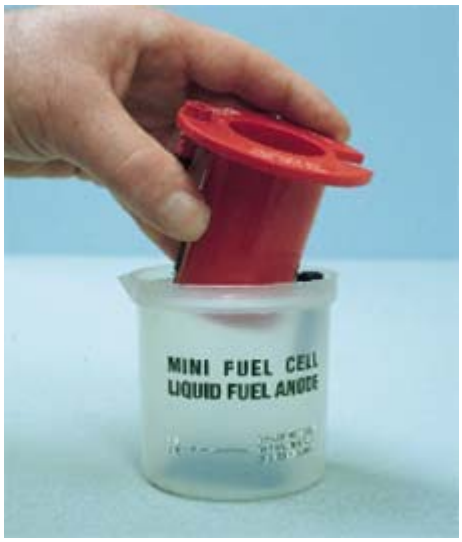
We can gather them together in a table:

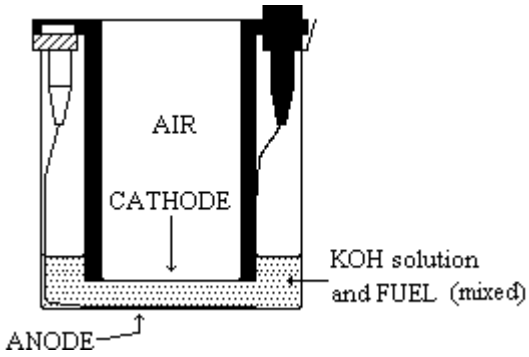
| | |
|---|---|
| Power of the motor | 5,9 kw |
| Autonomy (at 30 km/hour in average) | 200 km |
| Max speed | 60 km/hour |
| Weight of the scooter equipped | 130 kg |

We have chosen a high power because this scooter is destined to an urban utilisation. Indeed, this type of utilisation needs a lot of power because of the numerous starting.

We can notice that the weight of this new scooter is more important than the petrol scooter, about 50 kg, which is satisfactory.

To have this power, we have to use a lot of fuel cells which are very small, as a diagram and a photo can show it. Indeed, on the photo we can compare the size of one fuel cell and the size of a hand.




As far as the size of the equipment is concerned, the better is to look at the two photos of our prototype.

*Figure G.1 Fuel cell scooter prototype*

This photo represents a scooter frame.

*Figure G.2 Closeup of scooter power system*

These two photos show us that this new equipment is not too cumbersome. Moreover, this is only a prototype, so this bulk will certainly be less important.

We have to precise that, to protect our know-how, our technical proposition comprises a specific clause. The membranes, which are essential for the assembling of a fuel cell, will be produced in our factory, in France. We undertake to provide them during the ten first years of our collaboration.

This short presentation shows you that we have ever built a prototype corresponding to your technical expectations. Indeed, the performances of this prototype are quite good, particularly about the autonomy. So we can say that we master this technology then you can trust us.

# 3 THE BUILDING OF THE NEW FUEL-CELL PRODUCTION LINE IN TAIPEI

We will start to design and build the new production line at the beginning of July 2002. Our staff will supervise with your assistance the construction which will take about 2 months. This period is very short because we have develop a concept of turn key plant in order to be highly reactive on the fuel cells market.

This production line will have a maximum production capacity of 1000 fuel cells per month. With this capacity the joint venture will be able to satisfy the needs for about 10 years (hyp.: a sales increase of 10% per year). The first year, the fuel-cell line of production need to run correctly 46 employees : 8 engineers, 36 technicians and 2 for maintenance.

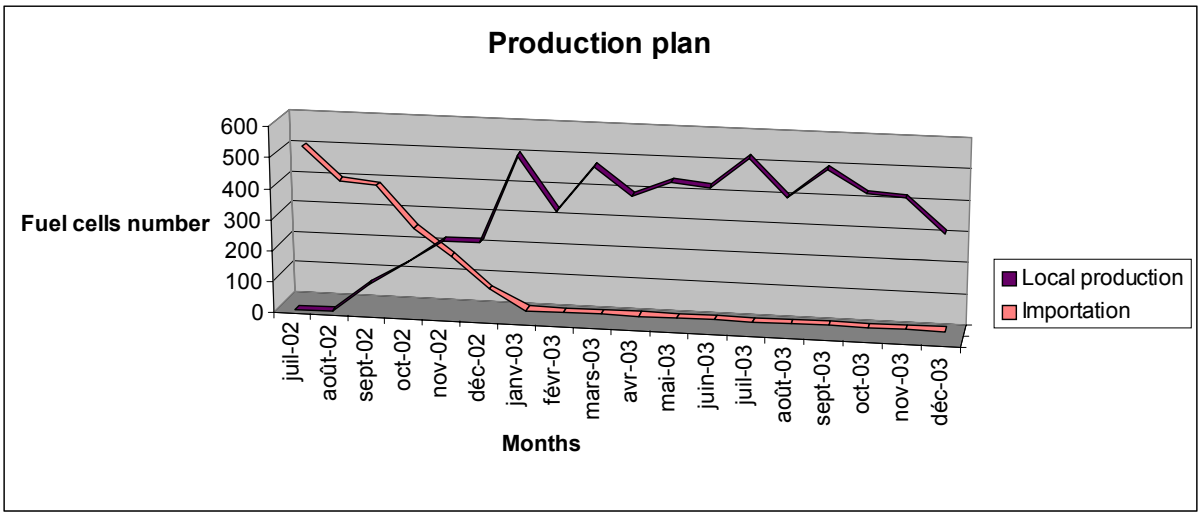
The foreseeable cost of the line construction will be USD1 million.

## 3.1 The fuel cells supplies program

The local fuel-cell production will start at the beginning of September 2002. Until the local production start, our company will export the needed number of fuel cells. The exports will be progressively replaced by Taipei production. The Taipei production line will reach its complete capacity at the beginning of January 2003.

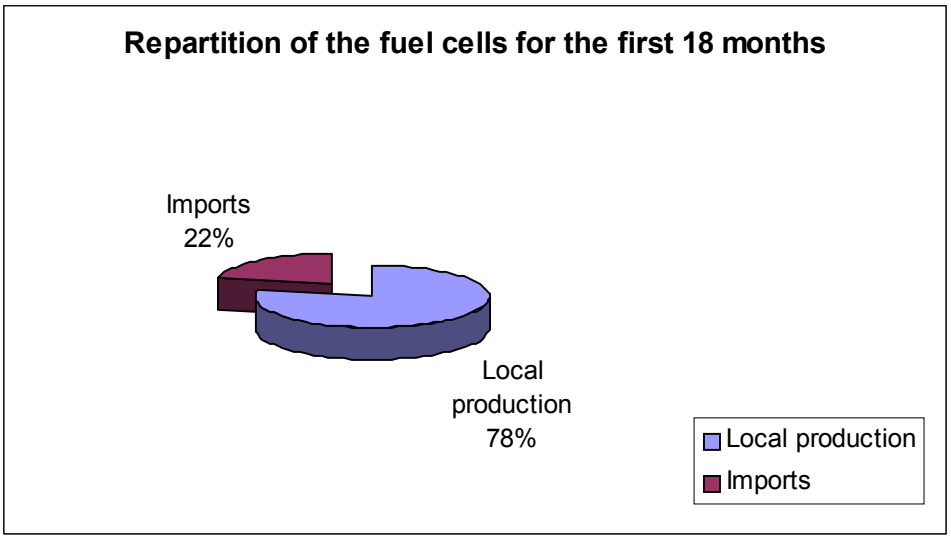
Based on the sales of scooters last year in Taiwan *(source : www.ttvma.org/statistic.htm)* , we have established monthly coefficient and then an indicative supplies timetable.

| | j-02 | a-02 | s-02 | o-02 | n-02 | d-02 | j-03 | f-03 | m-03 | a-03 | m-03 | j-03 | j-03 | a-03 | s-03 | o-03 | n-03 | d-03 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly coefficient | 0.10 | 0.08 | 0.10 | 0.08 | 0.08 | 0.06 | 0.10 | 0.07 | 0.09 | 0.08 | 0.09 | 0.08 | 0.10 | 0.08 | 0.10 | 0.08 | 0.08 | 0.06 |
| Total need | 503 | 395 | 481 | 416 | 410 | 311 | 531 | 360 | 506 | 418 | 469 | 455 | 553 | 434 | 529 | 458 | 450 | 342 |
| % Local production | 0% | 0% | 20% | 40% | 60% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| % Importation | 100% | 100% | 80% | 60% | 40% | 20% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Local production | 0 | 0 | 97 | 167 | 246 | 249 | 531 | 360 | 506 | 418 | 469 | 455 | 553 | 434 | 529 | 458 | 450 | 342 |
| Importation | 503 | 395 | 385 | 250 | 164 | 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |




## 3.2 The conditions of the imports

Our company is able to supply you with fuel cells produced in our factories in France during the building and the starting of the Taipei production line. Our staff think that for the first year the joint venture will need about 1 760 imported fuel cells.



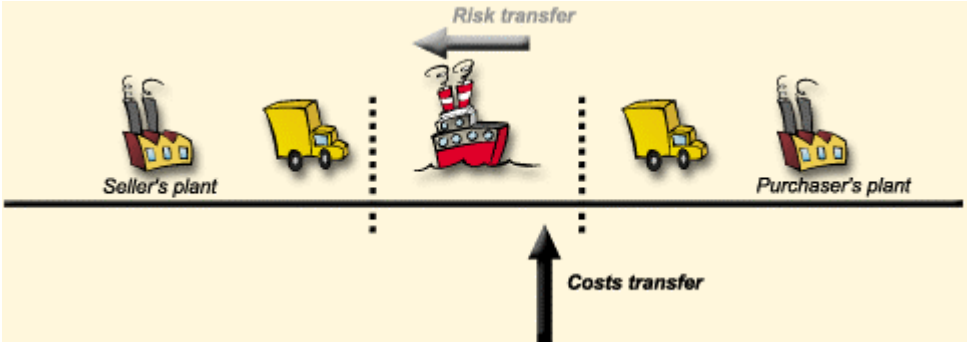

The price of imported fuel cells per unit is USD800. This price is the production cost of fuel cells, our company will make no profits with these exports. Usually our exports are done CIF (Cost, Insurance and Freight). Then, our company suggests that the fuel cells exports would be delivered CIF to Taipei.

| | Costs | Risks |
|---|---|---|
| Packing | S | S |
| Pre-forwarding | S | S |
| Outwards customs clearance | S | S |
| Loading onto the main transport | S | S or B* |
| Main transport | S | B |
| Transport insurance | S | B |
| Unloading of the main transport | S or B* | B |
| Inwards customs clearance | B | B |
| Post-forwarding | B | B |

S : costs/risks at the seller's expense

B : costs/risks at the buyer' s expense

* depending on the transport contract




This way of transport is easier because we are in charge of all the formalities in our country and your company is in charge of the inwards customs clearance.

### 3.3 Cost of the supplies during the first 6 months

Building of the production line : US$ 1 000 000

Cost of the imports : 1760*800 = US$ 1 408 000

CleanTek proposes you that only 50% of the fuel cells would be paid by the joint venture and the others 50% would be brought in nature to the joint venture.

Before launching the methanol fuel cell scooters commercialization phase, the needs for fuelling infrastructure to serve these vehicles must be addressed. As a consequence, the most likely scenario for developing a methanol fuel distribution system would involve utilizing the existing gasoline distribution system by adding methanol fuelling capacity to existing retail gasoline outlets.

This study looks at :

- the capital costs associated with the way of accomplishing this objective
- the gas stations network

# 4 REFUELING STATIONS IMPLEMENTATION NEEDS

## 4.1 requirements for methanol fueLing stations

While replacement of the internal combustion engines with fuel cell electrochemical engines represents a radical change in technology, developing a fueling infrastructure for these vehicles does not. Refueling stations for dispensing methanol will be very similar to today's gasoline fueling stations, having the same layout and employing the same types of equipment.

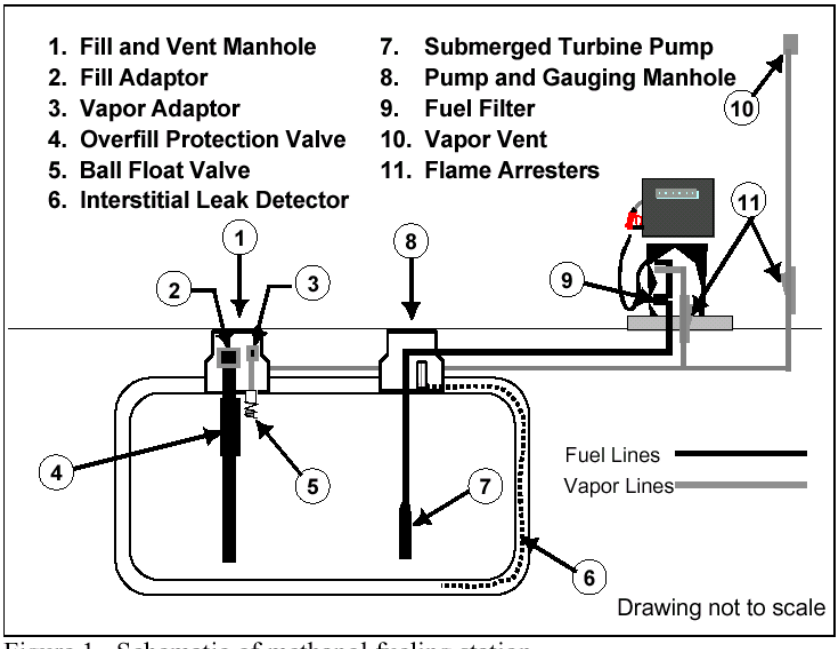



Figure 1. Schematic of methanol fueling station

It is assumed that the dispensing of methanol is added to an existing retail gasoline station. This may be accomplished by adding a new underground methanol fuel tank, remote from the

existing tank field. An above ground tank might be added where space and permitting allow. Above ground tank must be located at least from any major building, property line, or public way. One single product, two-hose fuel dispenser is added, providing the capability to refuel about 40 vehicles per hour. All other fuel system components, such as product and vapor piping, pumps, etc. are new and methanol compatible.

**Increase Throughput of An Existing Station by Adding 33,000 gal./month of Methanol Capacity**

| | Urban Underground Tank | Rural Above-ground Tank |
|---|---|---|
| **MATERIALS** | | |
| 10,000 gallon double-walled storage tank | $17,553 | $25,850 |
| Interstitial leak detector probe | $1,200 | $1,200 |
| Fill & vapor adaptors, overfill, and ball float valves | $640 | $640 |
| 1/3 hp submersible turbine pump w/ leak detector | $1,426 | $1,426 |
| Dispenser, nozzles, hoses, and fittings | $8,645 | $8,645 |
| Vent valve and flame arrestors | $1,580 | $1,580 |
| Download piping | $300 | $1,000 |
| Product and vent piping | $390 | $650 |
| **SUB TOTAL** | **$31,734** | **$40,991** |
| Contingency | $3,173 | $3,963 |
| **TOTAL MATERIALS** | **$34,907** | **$44,954** |
| **LABOR** | | |
| Install tank, piping, vent system, etc | $25,000 | $10,000 |
| Labor contingency | $2,500 | $1,000 |
| **TOTAL LABOR** | $27,500 | $11,000 |

The cost for installing the underground storage tank includes all labor (including electrician) and equipment to excavate for the new tank, to dispose of excess soil, to connect piping, monitoring, and dispensing systems, to backfill, and to restore paved surfaces. The cost also includes soil samples and lab fees, permits, and tank testing.

The time required to install a new underground tank was estimated to be about 10 days, while an above ground tank can be installed in about five days. The effect on station operations would, of course, depend on the location of the installations relative to commercial areas and vehicle driveways.

## 4.2 Partnership

We are going to negotiate a partnership with petroleum companies. The contract statements are the following :

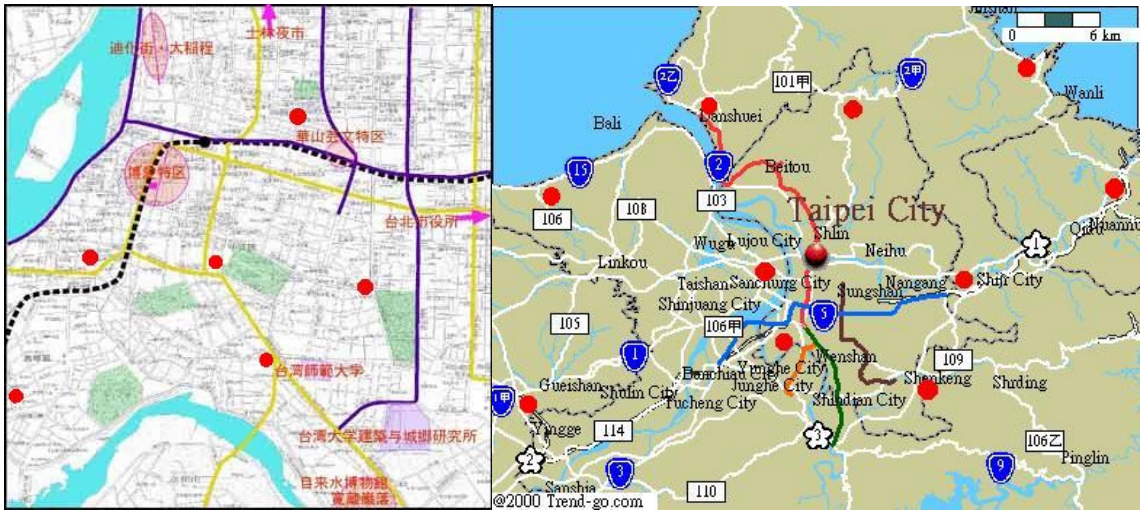
The Joint venture invest a fixed amount into petroleum companies for cost compensations linked to the launching of this new fuel (especially the refueling station implementation). In exchange, petroleum companies takes back the whole margin on this new methanol developing market.

## 4.3 Gas stations network

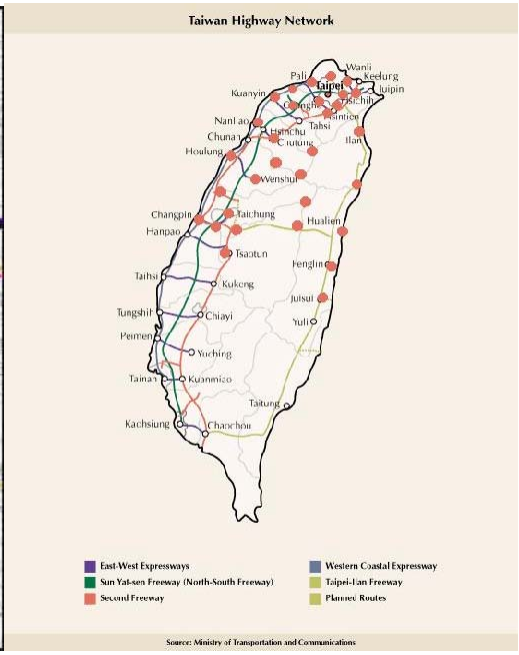
The gas station network implementation takes into account :

- Population density
- Road network

➢ First year : 8 methanol fueling stations implementation in Taipei city and suburbs (3 in downtown and 5 in suburbs) total : 8 as shown on the map :




➢ Second year : methanol fueling stations implementation in Taipei city and suburbs 7 more ( 2 in downtown and 5 in suburbs) total : 15 (5 downtown and 14 suburbs)


- Third year : global development in Taiwan 6 more ( 2 in downtown and 4 in suburbs) total : 21 (7 downtown and 14 in suburbs)


# 5 TRAINING

## 5.1 Foreward

Our company already possesses a training department, where we propose training sessions for the French personnel newly recruited. The heads and specialists of the different specialized services intervene during this sessions.

In order to define a suitable training program for the Joint Venture employees, we estimate that a previous visit of the **TGTM** factory is essential to determine the current technical knowledge and the know-how of the local workforce. Consequently, the program below is a preliminary one.

## 5.2 General considerations

### 5.2.1 Objectives

Our training program will provide the employees with a methodological and technical expertise as well as all the necessary managerial skills in all the project domains.

### 5.2.2 Place

The training will be provided in France considering that we have all the functional structures; in this way the practical training part setup will be easier.

### 5.2.3 Period

The training period will start as soon as the adaptation work of the production lines is finished in France. We estimate that will be effective from April 2002.

### 5.2.4 Concerned staff

Since training is set in France, the training will concern mechanical engineers and fuel-cell engineers. In this way, the training costs (i. e. traveling and accommodation expenses) will be lower. The trained engineers, will then train the technicians in Taiwan from August 2002.

### 5.2.5 Trainers

The theoretical part of the training will be provided by the heads and specialists of the different sections.

The pupils will be accompanied by an experienced technician for the practical parts of training.

### 5.2.6 Training language

The language used during the training will be English.

## 5.3 Program content

Our training program, of three month's duration, is defined as follows :

- A General teaching module : the goal of this teaching module is to present the entire manufacturing network of the fuel-cell equipped scooters design and production. In this way, the personnel will have a global view of the production process.
- Specialized teaching modules : the objective is to provide to engineers managerial skills and technical expertise in the following domains :
    - *Session 1 : production of the fuel cell*
    - *Session 2 : assembly of the fuel cell on the scooters*

The details of the program as well as the duration and staff concerned are presented in the table below.

| Teaching module | Period | Staff concerned | Content |
|---|---|---|---|
| **General** | 1 week<br>40 hours | Manager<br>Engineers | - Company presentation<br>- Presentation of the technology (i.e. all the facts about the running of the fuel cell) and its implication in economic and environmental terms.<br>- Visit of the entire manufacturing network |
| **Specialized** | | | |
| *Session 1* | 3 months<br>(360 hours : *130 hours for theoretical part, 130 hours for the application part*) | Fuel-cell engineers | - Design and assembly of the fuel cell present the steps for the fuel cell production<br>- Maintenance[(a)]<br>- Quality insurance [(b)]<br>- Safety [(c)] |
| *Session 2* | 6 months<br>(360 hours *: 130 hours for theoretical part, 130 hours for the practical part*) | Mechanical engineers | - Assembly on the scooter chassis<br>- Maintenance of the operation[(a)]<br>- Quality Insurance [(b)]<br>- Safety [(c)] |

(a) Maintenance : present the systematic and pre-established procedure for the material maintenance

(b) Quality insurance : present the whole systematic and pre-established procedures to follow during the production process to guarantee the best quality of the new products.

(c) Safety : this part is designed to indicate the systematic and pre-established practices for safe work. The safety rules and protective equipment will be presented.

## 5.4 Cost evaluation in USD

The training cost include trainers wages, the traveling and accommodation expenses.

- Wages

| | Number | Cost per hour | Number of hours | Total |
|---|---|---|---|---|
| Trainers | 8 | US$ 145 | 360 | US$ 420 000 |

- Traveling expenses

| | Number of round trip tickets | Unit price in USD | Total cost in USD |
|---|---|---|---|
| TGTM factory visit | | | |
| French managers | 6 | $ 2 000 | $ 12 000 |
| French trainers | 8 | $ 2 000 | $ 16 000 |
| Training period | | | |
| Managers | 4 | $ 2 000 | $ 8 000 |
| Engineers | 8 | $ 2 000 | $ 16 000 |
| **Total** | | | **$ 52 000** |

- Accommodation expenses

| | Number | Accommodation expenses per day in USD | Number of days | Total in USD |
|---|---|---|---|---|
| TGTM factory visit | | | | |
| French managers | 6 | $ 150 | 7 | $ 6 300 |
| French trainers | 8 | $ 150 | 7 | $ 8 400 |
| Training period | | | | |
| Managers | 4 | $ 150 | 7 | $ 4 200 |
| Engineers | 8 | $ 150 | 84 | $ 100 800 |
| **Total** | | | | **$ 119 700** |

- Total training cost in USD

| | Amount |
|---|---|
| Wages | $ 420 000 |
| Traveling expenses | $ 52 000 |
| Accommodation expenses | $ 119 700 |
| **Total** | **$ 591 000** |

# 6 FINANCIAL PART

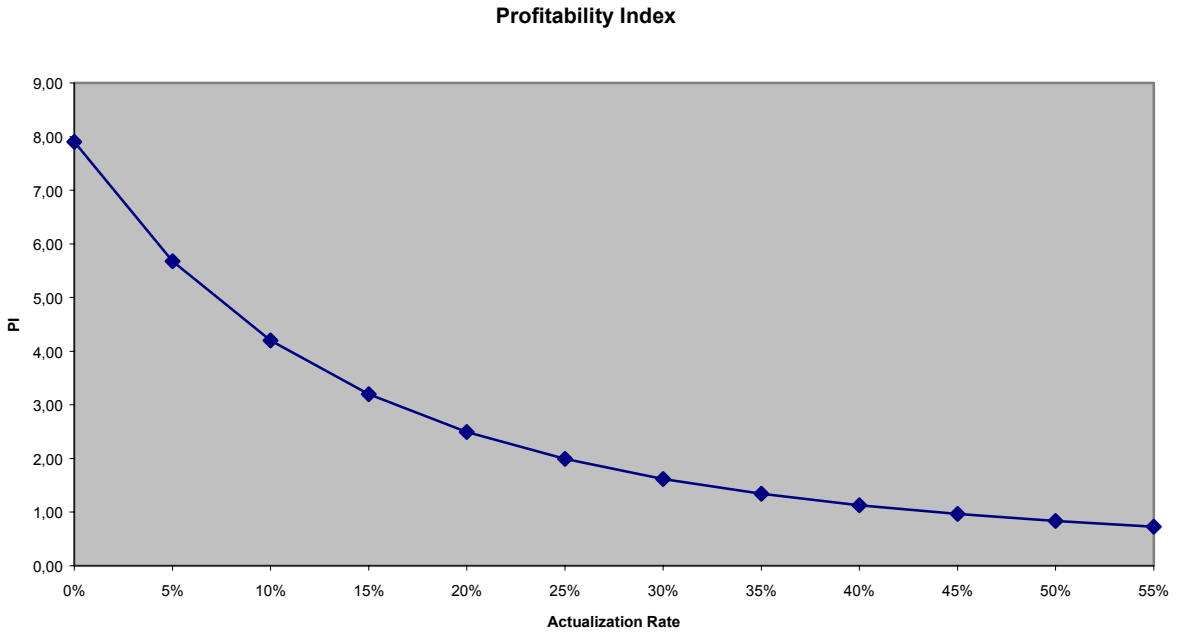
## 6.1 Cash flows

| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Investment** | | | | | | | | | | | | |
| | Fuel cell production line | $1 000 000 | | | | | | | | | | |
| | Scooters production line | $2 000 000 | | | | | | | | | | |
| | Buildings | $500 000 | | | | | | | | | | |
| | Training package | $591 700 | | | | | | | | | | |
| | Adaptation of the scooter for the fuel cell | $200 000 | | | | | | | | | | |
| | 50% fuel cells import | $704 000 | | | | | | | | | | |
| | Total | $4 995 700 | | | | | | | | | | |
| **Turn over** | | | | | | | | | | | | |
| | Units sold (+10% each year during 10 years) | | 2509 | 5500 | 6050 | 6655 | 7321 | 8053 | 8858 | 9744 | 10718 | 11790 |
| | Total | | $6 021 600 | $13 200 000 | $14 520 000 | $15 972 000 | $17 569 200 | $19 326 120 | $21 258 732 | $23 384 605 | $25 723 066 | $28 295 372 |
| **Expenses** | | | | | | | | | | | | |
| | 50% fuel cells import | | $704 000 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | (+) Fuel cells raw materials | | $262 150 | $1 925 000 | $2 117 500 | $2 329 250 | $2 562 175 | $2 818 393 | $3 100 232 | $3 410 255 | $3 751 280 | $4 126 408 |
| | (+) Scooters raw materials | | $1 129 050 | $2 475 000 | $2 722 500 | $2 994 750 | $3 294 225 | $3 623 648 | $3 986 012 | $4 384 613 | $4 823 075 | $5 305 382 |
| | (+) Membranes | | $112 350 | $825 000 | $907 500 | $998 250 | $1 098 075 | $1 207 883 | $1 328 671 | $1 461 538 | $1 607 692 | $1 768 461 |
| | (=) Purchases cost resales material | | $2 207 550 | $5 225 000 | $5 747 500 | $6 322 250 | $6 954 475 | $7 649 923 | $8 414 915 | $9 256 406 | $10 182 047 | $11 200 252 |
| | (+) stock (1/2 month per year) | | $91 981 | $125 727 | $21 771 | $23 948 | $26 343 | $28 977 | $31 875 | $35 062 | $38 568 | -$424 252 |
| | (=) Purchases to be sold | | $2 299 531 | $5 350 727 | $5 769 271 | $6 346 198 | $6 980 818 | $7 678 899 | $8 446 789 | $9 291 468 | $10 220 615 | $10 776 000 |
| | (+) Stock variations | | -$91 981 | -$125 727 | -$21 771 | -$23 948 | -$26 343 | -$28 977 | -$31 875 | -$35 062 | -$38 568 | $424 252 |
| | (=) Purchases consumption sold throughout the year | | $2 207 550 | $5 225 000 | $5 747 500 | $6 322 250 | $6 954 475 | $7 649 923 | $8 414 915 | $9 256 406 | $10 182 047 | $11 200 252 |
| | (+) Personnel for fuel cells production | | $599 564 | $1 888 627 | $1 983 058 | $2 082 211 | $2 186 321 | $2 295 637 | $2 410 419 | $2 530 940 | $2 657 487 | $2 790 362 |
| | (+) Personnel for scooters production | | $755 972 | $2 381 312 | $2 500 377 | $2 625 396 | $2 756 666 | $2 894 499 | $3 039 224 | $3 191 186 | $3 350 745 | $3 518 282 |
| | (+) R&D costs | | $66 667 | $210 000 | $220 500 | $231 525 | $243 101 | $255 256 | $268 019 | $281 420 | $295 491 | $310 266 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (+) Depreciation | | $625 000 | $625 000 | $625 000 | $625 000 | $625 000 | $25 000 | $25 000 | $25 000 | $25 000 | $25 000 |
| (+) Distribution Costs | | $221 209 | $484 913 | $533 405 | $586 745 | $645 420 | $709 962 | $780 958 | $859 054 | $944 959 | $1 039 455 |
| (+) Distribution of methanol | | $1 133 982 | $952 715 | $833 845 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Total expenses | | $5 609 943 | $11 767 567 | $12 443 685 | $12 473 127 | $13 410 983 | $13 830 277 | $14 938 535 | $16 144 006 | $17 455 729 | $18 883 616 |
| | | | | | | | | | | | |
| Operating Profit | | $411 657 | $1 432 433 | $2 076 315 | $3 498 873 | $4 158 217 | $5 495 843 | $6 320 197 | $7 240 599 | $8 267 337 | $9 411 756 |
| (-) exceptional costs | | | | | | | | | | | $375 000 |
| (=) Gross Profit | | $411 657 | $1 432 433 | $2 076 315 | $3 498 873 | $4 158 217 | $5 495 843 | $6 320 197 | $7 240 599 | $8 267 337 | $9 036 756 |
| (-) Corporate Tax | | $102 914 | $358 108 | $519 079 | $874 718 | $1 039 554 | $1 373 961 | $1 580 049 | $1 810 150 | $2 066 834 | $2 352 939 |
| (=) Net Profit | | $308 742 | $1 074 325 | $1 557 236 | $2 624 154 | $3 118 662 | $4 121 882 | $4 740 147 | $5 430 449 | $6 200 502 | $6 683 817 |
| (+) Depreciation | | $625 000 | $625 000 | $625 000 | $625 000 | $625 000 | $25 000 | $25 000 | $25 000 | $25 000 | $25 000 |
| (+) Net accounted value | | | | | | | | | | | $375 000 |
| (-) Cash needs variations | | $91 981 | $125 727 | $21 771 | $23 948 | $26 343 | $28 977 | $31 875 | $35 062 | $38 568 | -$424 252 |
| Net Cash Flows | -$4 995 700 | $841 761 | $1 573 598 | $2 160 465 | $3 225 207 | $3 717 320 | $4 117 905 | $4 733 273 | $5 420 387 | $6 186 934 | $7 508 069 |

## 6.2 Profitability boards

Profitability Index : one dollar invested today will become 8 dollars at the end of the project with an actualization rate of 0%




Profitability board : with a 0% actualization rate, the project becomes profitable from the 4th year

| Actualization rate | Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0% | | -$4 153 939 | -$2 580 341 | -$419 876 | $2 805 331 | $6 522 651 | $10 640 556 | $15 373 828 | $20 794 216 | $26 981 150 | $34 489 219 |
| 5% | | -$4 194 023 | -$2 766 723 | -$900 432 | $1 752 954 | $4 665 571 | $7 738 415 | $11 102 263 | $14 770 995 | $18 759 148 | $23 368 451 |
| 10% | | -$4 230 463 | -$2 929 968 | -$1 306 779 | $896 081 | $3 204 244 | $5 528 694 | $7 957 611 | $10 486 262 | $13 110 126 | $16 004 811 |
| 15% | | -$4 263 734 | -$3 073 868 | -$1 653 327 | $190 696 | $2 038 861 | $3 819 144 | $5 598 557 | $7 370 491 | $9 129 204 | $10 985 084 |
| 20% | | -$4 294 232 | -$3 201 456 | -$1 951 187 | -$395 821 | $1 098 086 | $2 477 165 | $3 798 134 | $5 058 743 | $6 257 812 | $7 470 407 |
| 25% | | -$4 322 291 | -$3 315 188 | -$2 209 030 | -$887 986 | $330 106 | $1 409 590 | $2 402 229 | $3 311 619 | $4 142 015 | $4 948 188 |
| 30% | | -$4 348 191 | -$3 417 068 | -$2 433 698 | -$1 304 463 | -$303 281 | $549 851 | $1 304 175 | $1 968 658 | $2 552 083 | $3 096 704 |
| 35% | | -$4 372 173 | -$3 508 745 | -$2 630 641 | -$1 659 634 | -$830 621 | -$150 363 | $428 832 | $920 147 | $1 335 552 | $1 708 966 |
| 40% | | -$4 394 442 | -$3 591 586 | -$2 804 244 | -$1 964 697 | -$1 273 519 | -$726 619 | -$277 599 | $89 688 | $389 138 | $648 704 |
| 45% | | -$4 415 175 | -$3 666 734 | -$2 958 065 | -$2 228 464 | -$1 648 515 | -$1 205 449 | -$854 224 | -$576 837 | -$358 481 | -$175 735 |
| 50% | | -$4 434 526 | -$3 735 149 | -$3 095 011 | -$2 457 933 | -$1 968 410 | -$1 606 893 | -$1 329 865 | -$1 118 370 | -$957 434 | -$827 232 |

# 7 JOINT VENTURE

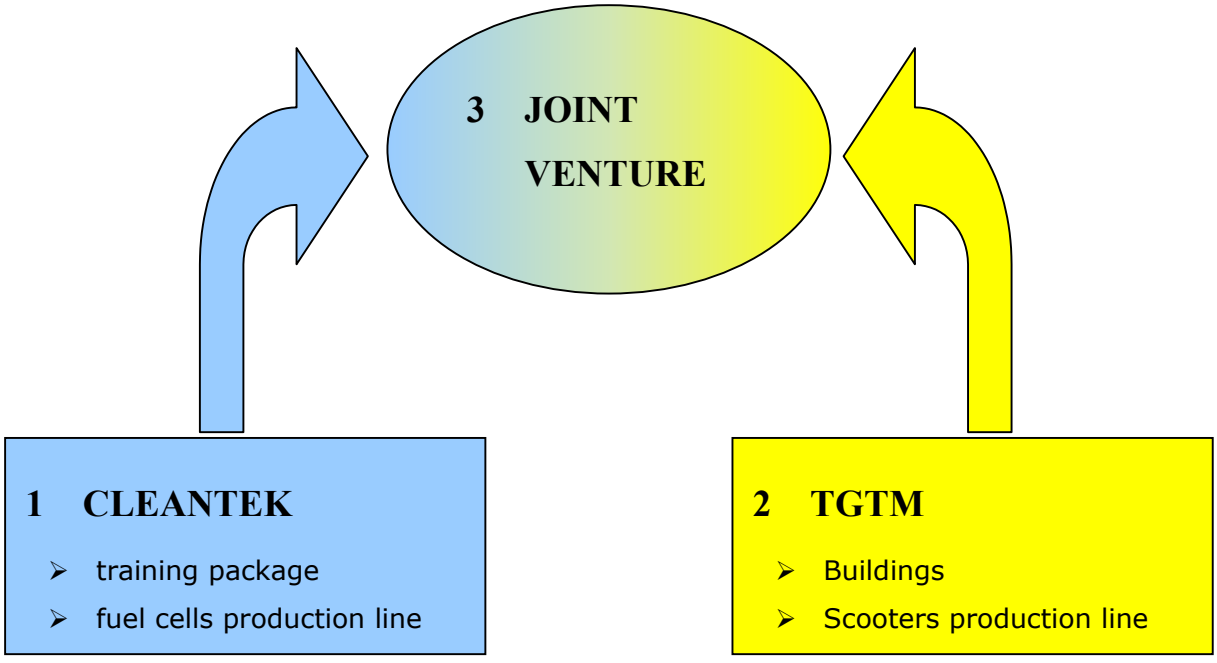
## 7.1 The organization of the joint venture :

Our proposal includes the fuel cells production line and the scooters production line in the JV.

We have considered that the JV will be totally independent from the 2 firms. It means all charges will be paid by the JV : raw materials (including membranes), personnel, 50% of fuel cells imports in first year, distribution of methanol, distribution costs of scooters …

Concerning cash needs, we suppose that there will be a favourable delay between the scooters sales and the suppliers payments.

Moreover we have signed a contract with a petroleum company which allows us a one-year credit amounting to one million dollars.



| CleanTek | | TGTM | |
|---|---|---|---|
| Fuel cells production line | $1 000 000 | Scooters production line | $2 000 000 |
| Training package | $591 700 | Buildings | $500 000 |
| 50% of fuel cells imports | $700 000 | Adaptation of the scooter for the fuel cell | $200 000 |
| **Total** | **$2 291 700** | **Total** | **$2 700 000** |
| **Percentage** | **46%** | **Percentage** | **54%** |

Based on this cost board, we propose you the followed capital breakdown :