CITELEC: European association of cities interested in electric vehicles

M. Liccardo, G. Maggetto - CITELEC

INTRODUCTION

In modern cities and urban communities, the concern for environmental issues is growing, owing to the rapid deterioration of life quality in the city due to several kinds of pollution and nuisance.
Much of this pollution and nuisance is being caused by automobile traffic: motor vehicles have become the biggest obstacle to clean air in cities.
The development, during the last decades, of a lifestyle based on individual mobility and private car ownership, has shown many disadvantages for the environment: directly measurable influences like air and noise pollution, but also many side effects like traffic hazards, traffic congestion which can ultimately annihilate the intended mobility, losses of time, parking problems and not to forget the visual pollution caused by the massive impact of roads and vehicles on the aspect of the city.

On the other hand, a city is a "living organism" in constant evolution which should keep rolling on: traffic flows are the vital arteries of the city.

So nowadays city administrators see themselves faced with an important problem: how to improve life quality in their area while maintaining a sufficient level of mobility and a good flow of traffic?

Different management options are possible in this field: traffic control, new parking lots, etc… A successful solution can only rely on the developments of modern vehicle technology. The use of electricity as an alternative fuel is the most promising step in the right way. Electric vehicles will be an essential and inevitable part of our life in the future.
Electric vehicles cause much less pollution than internal-combustion engined ones. They are quiet without vibration, fun to drive and easy to maintain. They are also more efficient in their use of energy and allow a greater independence in the choice of primary energy sources. They are mainly recharged overnight, using excess generating capacity at power stations.

In this context of saving the quality of our living environment, considered today more than ever as an essential concern for our life at the end of this century, the cities have a major part to play, together with the authorities and the specialists, in an objective appraisal of the actual possibilities of such a means of transport, and of the improvements that the technological evolution could offer.
The actions they could consider are in the first place an throughout analysis of their current organisation, of the problems to be solved and on the way to solve them. It is useless to imagine a new means of transport to be introduced as an alien object in the urban tissue. This would bring more disadvantages then benefits. Each new solution should be integrated harmoniously in a larger system, taking into account all

interactions with this system.
The adaptation of the new means of transport to the city, and also the adaptation of the city to the new means of transport, are to be studied thoroughly.

Such considerations lead to the conclusion of the seminar "The opportunity of electric vehicles in urban traffic", held in Bruges, Belgium on September 9, 1989. A memorandum was then undersigned stating the participants' intention of founding an Association of European cities to promote the use of electric vehicles as a contribution to solving the environment problem.

The inaugural meeting of that Association, which has been called CITELEC, was held in Brussels, Belgium on February 2, 1990. It was opened by Mr. Karel Van Miert, Member of the Commission of European Communities, who emphasized the importance of the event, because it could be a way of finally identifying a significant market for users and manufacturers alike.

The Association was founded in the wake of the COST 302 action (Scientific and Technical Cooperation: "Technical and economical conditions for the use of electric road vehicles"), where from 1982 to 1986 eleven European countries studied the technical and economic conditions for the use of electric road vehicles. The report of this action estimated the number of vehicles that might be replaced by electric ones at 7 million. These could almost entirely be located in towns and cities, giving an estimated 20-30 % potential reduction in air pollution.

AIMS AND OBJECTS OF CITELEC

CITELEC, European association of cities interested in the use of electric vehicles, is a non-profit organisation subject to the Belgian law of October 25, 1919 granting legal status to international associations with philanthropic, religious, scientific, artistic or educational aims.
The object of the Association shall be to accomplish any act of study, demonstration and information in the technical, scientific, economical, ecological or sociological fields, which is effective in promoting the private or public use of electric vehicles in towns and cities, having regard to the decisive contribution of these vehicles to improving the urban environment.

To this effect, CITELEC will study the environmental, administrative and economic aspects of the introduction of electric vehicles, develop demonstration programmes for electric vehicles, evaluate new vehicles on the market, and promote new development projects.
The Association keeps in contact with relevant national and international organizations and spreads information by way of its own publications and by way of seminars, conferences and lectures in the field of new transport techniques.

ACTIONS OF CITELEC

CITELEC being an Association created under the patronage of the European Community, the actions of the Association will complement other European actions in the field of electric vehicles.

The action plan of CITELEC could be summarized as follows:

1 **Information actions**

Many potential users of electric vehicles are unaware of the opportunities for modern electric vehicles. They still have the image of a slow, cumbersome and unattractive vehicle. So CITELEC provides documentation on the electric vehicle as a product, highlighting non-polluting aspects and giving potential users a better knowledge of the product. The experience of cities already using electric vehicles is also a valuable information source to be exchanged.

The information should provide the user with correct technical and economical data enabling to solve the transport problems he is facing.

2 **Definition of requirements**

Passenger and goods traffic in cities are causing a lot of problems. A large part of these problems can be solved by a global reorganization of traffic inside and towards cities. An analysis of the part to be played by electric vehicles in this reorganization, by the means of surveying and studying users or potential users of electric vehicles, will allow to establish, analyse and specify actual requirements. In this way, a market for electric vehicles will be defined. The presence of a market is essential to allow manufacturers to offer the right product at the right conditions.

To assess these requirements, a survey of vehicle use by municipalities has been performed. The results of this survey are presented below.

3 **User training**

Owing to its energy source and propulsion system, an electric vehicle is something completely different form any internal-combustion engined vehicle.It's not petrol, nor diesel, nor even LPG. It's electric!

The attitude and behaviour of the user is to be adapted: to this effect, CITELEC shows, systematically and in depth, what precisely are "electric vehicles" and how to use them. A good preparation of fleet management, energy management and servicing will enhance the economic operation of electric vehicle fleets in cities.

4 **Demonstration actions**

Demonstration actions bring together manufacturers and potential users of electric vehicles. The CITELEC approach to electric vehicle demonstrations is a straightforward one: the vehicles under "test" operate in conditions close to real life: in daily urban traffic, instead of on a closed race-track. This leads to the test demonstrations called the "12 Electric Hours". Electric vehicles ride the streets during twelve hours, divided in two six hour periods, with charging stops when needed. The published results show distance covered over 12 hours, actual driving time, energy consumption, relative energy consumption (kWh/km and kWh/ton.km), and show also the vehicle characteristics (battery, charger and electric drive used).

"12 Electric Hours" have been organized in Brussels, Belgium (1987); Bruges, Belgium (1989); La Rochelle, France (1990) and Padova, Italy (1991).

Each time, the electric vehicles participating were able to cover considerable distances, taking into account the low medium speed of city traffic. Internal-combustion engined vehicles are participating in the test for comparison; the electrics could well cope with them.

The organization of "12 Electric Hours" test demonstrations is a regular activity of CITELEC. Many cities, especially those of medium use, provide a very good setting for such demonstration exercises.

5 Impact studies

The massive introduction of electrically propulsed vehicles in urban areas is a major operation, the impact of which is to be forecast to know its - obvious - advantages.

A first group of studies is aimed on traffic organisation in towns: limiting of traffic and establishing the link between (electrified) individual transport and (electrified) public transport.

A second group is aimed towards urban development actions. Massive deployment of electrically propulsed vehicles will have a major influence on the design of the city and on its infrastructures. The aim of CITELEC is here to provide a "blueprint of the electrified city", for the use of city representatives who also want to take part of the benefits involved with electric vehicle operation.

A TYPICAL CITELEC ACTION: ENQUIRY ABOUT VEHICLE USE

CITELEC has performed an enquiry among tis members to assess the operation modes of municipal vehicles.
We are happy to present you the first results, covering twenty-five answers from CITELEC members. As to obtain a final result as complete as possible, we kindly ask the cities who did not yet submit their questionnaire to proceed with it as soon as possible. Anyway, we think it useful to publish some first results now.

Problems of city traffic

The general opinion of European cities is that the traffic situation in European city centres is slightly disturbed, and that this situation is not getting any better the last few years.
Parking in the city centre is difficult. Automobile traffic is thought to have a considerable influence on air pollution in the city centre.
The use of the road exposes to a number of traffic-related dangers. When measuring this risk on a scale from 0 to 100 % (0 % for a road user who runs no risk; 100 % for a road user who runs a very large risk), it comes out that cyclists (75 %), motocyclists (61 %) and pedestrians (57 %) are running a considerable risk. Car users (26 %) are much less at risk, and using public transportation (16 %) seems to be the safest. Note that this only relates to traffic-related dangers, and not to any other security problem in which road or public transport users may become involved.

Municipal vehicle fleets

All authorities who answered dispose of a proper vehicle fleet.
All together, not less than 5065 vehicles have been mentioned, in the following categories:

cat.	type	total fleet	average fleet	fleet/100000
a	passenger car	1067	56	47
b	small van (poids total< 2000 kg)	1107	61	48
c	minibus (≤ 20 pl)	62	5	5
d	van (poids total≤ 3500 kg)	810	54	44
e	lorry (poids total> 3500 kg)	449	26	20
f	bus	440	44	63
g	special vehicle for refuse/cleansing	402	30	27
h	other motor vehicles	728	56	47

The average size of the fleets was calculated from the number of answer where vehicles of that specific category were mentioned.
The third column gives the average fleet size, calculated for a "standard" town of 100000 inhabitants.
Categories a, b and d (i.e. cars and vans) are the most abundant; these vehicles will be considered more in particular, since they are liable to be converted to electric traction.
The large number of vehicles in category "h" represents many different types: motorcycles, farm tractors, lawnmowers,…

Conditions of use

As to determine the penetration potential of electric vehicles, let's consider the effective performances of these vehicles: the average yearly and daily mileages covered

	km/year	km/day
all kinds of vehicles together	11107	44
apassenger car	11717	49
bsmall van (< 2000 kg)	10086	76
cminibus (≤ 20 pl)	24300	130
dvan (≤ 3500 kg)	8875	45
elorry (> 3500 kg)	17100	70
f bus	60000	265
gspecial vehicle for refuse/cleansing	15200	63
hother motor vehicles	8167	33

One sees that the daily mileages are rather modest, exception made of buses and minibuses. These vehicles are of course used in scheduled line traffic. For minibuses not being used in scheduled traffic, the average daily mileage is only 50 km.
Based on these averages, one could state that most vehicles are eligible to be replaced by their electric equivalents. Since these values are only averages, one should consider however that there are vehicles covering regularly more than 100 km per day, a distance that can be considered as a practical operating range limit for today's electric vehicles. For the considered fleets, 393 vehicles were in this case, a mere 8 % of the total.

It can thus be stated that electric vehicles can cater for a large majority of urban services.

Practical conditions of use

Thanks to the low distances travelled, the average lifespan of a municipal vehicle is 9 years. The renewal of the fleets takes place at an average pace of 10 vehicles each year. Most vehicles are bought new, where possible through a local dealer. In most cases maintenance is done by the city's own workshops; 80 % of the vehicles is subject of a survey, particularly concerning the maintenance.

Decision criteria

Different criteria determine the choice of a new vehicle to be acquired. The principal criteria are listed following to their relative importance, measured on a 0 - 100 % scale.

Response to specific needs	89 %
Purchase price	83 %
After-sales service	64 %
Confidence in the make	61 %
Polyvalence	60 %
Price/performance ratio	55 %
Cost per kilometre	52 %
Environmental preservation (emissions)	46 %
Silence	44 %
Innovative aspect	32 %
Support to local commerce and industry	29 %
Delays of delivery	29 %
Range	24 %
Esthetics	18 %
Speed	16 %

One can see that the aspects "range" and "speed", which are more or less the "weak spots" of the electric vehicle, are not considered as very important; in city conditions, they are not needed anyway.
Environmental aspects (emissions, noise) are criteria of medium importance.
"Purchase price" turns out a much "heavier" criterion than "cost per kilometre". This is hardly favourable for the electric vehicle; it has been proved however that the electric vehicle is able to compensate its higher purchase price through a very low cost per kilometre.

The electric solution

In 36 % of the cases, electric vehicles are present in the municipal fleets, though this presence can be very modest. In 67 % of these cases, the electric vehicles were

introduced in the framework of an experiment.
The most important reasons for not having considered the introduction of electric vehicles yet are the high purchase price and the lack of knowledge of electric traction technology, which is quite different indeed for those who are used to traditional automobile technology.

The advantages of the electric vehicle are widely recognized: 100 % (!) of the answers stating that electric vehicles would bring a positive contribution to the improvement of the environment, and 96 % of the answers quote the same positive effect to the improvement of the city's image.
Traffic problems however are to be solved from a more general viewpoint than is done nowadays: only 32 % think that the electric vehicle, on its own, can bring a solution.
A large majority (96 %) shows a willingness to pay the electric vehicle (somewhat) more, on condition that operation costs would be less than with traditional vehicles and that the environmental impact would be clearly positive.

Which electric vehicle for the city?

The "ideal" characteristics for an urban electric vehicle, such as they could be included in vehicle specifications, are the following (averages of all responses):

	car category "a"	small van category "b"	van category "d"
maximum speed (km/h)	91	72	71
range (km)	92	100	80
payload (kg)	363	594	1433
life (years)	8	10	9

One can note that such values are in the line with today's electric vehicle performances, except for the payload. For electric vehicles, payloads generally turn out to be lower, because the traction battery takes up part of the load.

Aims and objectives of CITELEC

The questionnaire has been diffused to CITELEC members only; this gave a nice opportunity to assess what members expect from their Association. We listed the different requirements on a scale from 0 to 100 %.

- information on electric vehicles (88 %)
- evaluation of electric vehicles on the market (65 %)
- assistance in the decision-making concerning the acquirement of electric vehicles (35 %)
- assistance in the deployment of electric vehicles (27 %)
- formation and training (19 %)
- grouped orders (4 %)

Conclusions

The CITELEC enquiry has highlighted a well-known situation concerning the urban traffic situation. Clearly, small or medium-sized towns have not yet reached the degree of difficulty encountered in large cities.
The analysis of municipal vehicle fleets shows a very important penetration potential for electric vehicles. It is still necessary to precise the market, defining common specifications in a clear way.
This need is very evident: an adequate answer to this question should allow the development of electric vehicles, for which the price would not be the barrier it is today.
The information and evaluation role of CITELEC is thought to be very important; so we invite the manufacturers to put their "electric" products at the disposal of CITELEC, so the information file the cities are waiting for can be established.
The role of the electric vehicle for the solution of urban problems does not seem to be outlined very clearly; this is probably due to the fact that this equipment is not yet widely diffused in towns and shows the usefulness of large-scale demonstration programmes in an important number of cities.
CITELEC is preparing to further develop its actions, to inform its members about them and to develop them to the direct benefit of the members, proposing different direct participations in the framework of financial support schemes to be defined.

CITELEC AND THE CITY

Active members of the Association are cities, towns or conurbations in Europe, or any person or institution duly authorized to represent them.
CITELEC is offering its services to inform and help all interested cities. For a yearly contribution of 800 to 1750 ECU, according to the number of inhabitants, cities can enjoy all advantages of CITELEC membership. Members are informed on CITELEC's activities on a regular basis, and have direct access to all data and results managed by CITELEC.
Studies undertaken or coordinated by CITELEC can be financed from external sources to be defined in each case and are done in close collaboration with the cities concerned

CITELEC AND THE MANUFACTURERS

Manufacturers can join CITELEC as associate members. However, CITELEC is primarily an association of cities, who will show the manufacturers their needs and their way of thinking about the way transport technology could solve their problems. This way, manufactures have an opportunity to know potential customers for electric vehicles and to develop new markets for the product.

CONCLUSION

Electrically propulsed vehicles are to become to be the mainstay of urban transport in

the 21st century, and the cities and communities that deploy them will know exciting new opportunities for solving the problems they are facing today.