Letter of Understanding
On the Development and Market Introduction of Fuel Cell buses

From EvoBus, MAN, Solaris, Van Hool, APTS/VDL
To To whom it may concern

Preamble

Projections made by the International Organization of Public Transport (UITP) based on models of the International Energy Agency have demonstrated that, by 2025:

- 60% of the world population (4.5 bn people) will be living in urban areas
- Mobility in urban areas will increase by 50% compared to 2005
- The number of trips by privately owned motorized vehicles will increase by 80%

As a result, the GHG emissions and urban traffic fatalities will increase both by 30%.

In a business as usual scenario, the situation is unsustainable. Our generation has both the responsibility and the technical means to act now.

Public transport, in particular heavy duty urban buses, can play a major role in reversing this negative spiral for it has attractive market characteristics and provides operational prerequisites that are supportive of a technology launch.

Over the last decade, governments and the industry have given special attention to the introduction of hydrogen as a road transport fuel. Whereas hydrogen is not the only answer to the challenges ahead, it offers an effective way of coping with them:

- Zero tailpipe emissions, reduced well-to-wheel emissions, noise levels and vibrations
- Meets the energy challenges when using renewables
- Allows the development of a green economy and jobs

1. Market characteristics

Public entities or private operators acting in a legal public framework provide public transport. Hence, the markets are meeting political and environmental objectives (such as affordable and improved mobility, city air quality concerns, CO2 emissions, renewable energy policies). The public procurement process allows for regulated competition and funding is structured differently than for private mobility.

2. Operational prerequisites

Urban bus applications with stop-and-go traffic, changing loads, low commercial speed in all climates with virtually non-stop operation, are among the harshest service conditions.

Hence it is believed that this application will help further mature the technology, driving cost down while increasing durability and reliability of fuel cells.

Within this extreme application environment, a set of operational conditions are favorable:

- Only depot refueling stations are required as the buses resume their departing point at the end of the day ;
- A controlled operating environment: skilled drivers and trained mechanics.

3. Development and Roll-out of Hybrid Fuel Cell Buses

All signing Bus OEMs believe that a gradual and consistently growing number of fuel cell buses are required to reach the level of integration needed to make an impact.

Whether derived from automotive stacks or designs for heavy duty application, the hybrid fuel cell buses will, together with the latest battery technology, allow for the operational prerequisites of urban bus service: flexibility, operational range and reliability, at an acceptable premium and competitive to other zero local emission alternatives.

To achieve these goals, the signing bus OEMs anticipate that between 2017 and 2020 around 500 – 1000 urban buses can be put in service. As the bus industry is diverse, it is expected that various models, ranging from 8 meters to 24 meters, will be developed to meet specific market and application requirements. Each OEM will make its own judgment to develop, demonstrate and offer standard mainstream and/or niche products in the above time frame.

The above target is expected to be subject to supportive EU, national and local policies and continued reduction of vital cost components, including:

- Continuing funding schemes (public and private)
- Impact of the new European Directive on Clean Fuels
- Cost of fuel (in particular the discrepancy between the kWh price of electricity and green hydrogen), the cost of the fuel cell and the cost of the battery

It is expected that by 2020, the products will be commercial to the point that the above volume is reached and the above conditions continue to develop favorably. This implies that the purchase cost of the bus compared to a standard diesel bus will need to be supported or compensated by the CO2 abatement cost and the cost of the other pollutants in accordance with the European Directive.

The hydrogen refueling infrastructure should be put in place on a commercial basis, i.e. that the energy providers have their own programmes to develop, fund and implement the infrastructure based on each specific business case. Unlike private cars, the infrastructure and energy providers for urban bus application will know exactly what the fuel supply needs to be, at what cost it becomes competitive and are able to conclude multi-annual contracts with the operators.

Letter of Understanding

On the Development and Market Introduction of Fuel Cell Buses

EvoBus GmbH

By:_____

Name:Title:

Date:_____

MAN

By:_____

Name:

Title:

Date:_____

Solaris Bus & Coach S.A.

By:_____

Name:

Title:

Date: _____

Van Hool

By:_____

Name:

Title:

Date: _____

VDL/APTS

By:_____

Name:

Title:

Date: _____