



# BRAZILIAN FUEL CELL BUS

8th IPHE Implementation – Liaison Committee

## PROJECT BRA - 99/G32

Hydrogen Fuel Cell Bus for Urban Transport

11 – 14 June 2007  
Seoul – Republic of Korea

Marcio Schettino



# PARTICIPANTS

Ministério de  
Minas e Energia



**MINISTRY OF MINES AND ENERGY**



**Empresa Metropolitana de Transportes Urbanos  
de São Paulo S.A.  
SÃO PAULO STATE  
BUS AUTHORITY**



**United Nations  
Development  
Programme**



FINANCIADORA DE ESTUDOS E PROJETOS  
MINISTÉRIO DA CIÊNCIA E TECNOLOGIA

**Projects  
and Studies  
Financing**



**GEF  
Global  
Environment  
Facility**



# PROJECTS OBJECTIVES

- Reducing emission of pollutants
- Demonstrate functionality and reliability of fuel cell buses and their fuelling infrastructure, under real operating conditions in the São Paulo Metropolitan Region
- Develop fuel cell buses based on Brazilian chassis and body designs
- Aimed to accelerate the commercialization of fuel cell buses which can use hydrogen from renewable resources (hydropower, ethanol, sugarcane tops/leaves)
- Acquire and disseminate technical knowledge (operation, maintenance and manufacture)



# CONSORTIUM

**EPRI**  
LEADER

BUS

**BALLARD**

FUEL CELL

**NUCELLSYS**

FUEL CELL SYSTEM

**tuttotrasporti**

CHASSI / INTEGRATOR

**Marcopolo**

BUS BODY

H2 INFRASTRUCTURE

**HYDROGENICS**  
CORPORATION

ELECTROLYSER  
STORAGE / DISPENSER

**BR**  
**PETROBRAS**

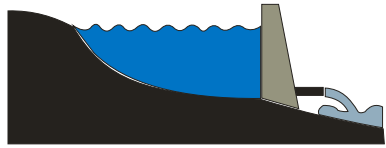
IMPLEMENTATION / OPERATION

**AS ELETROPAULO**

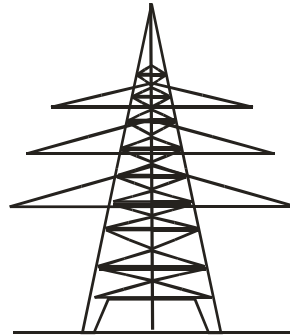
ENERGY POWER



# OPERATION



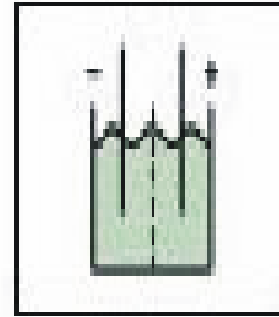
Hydropower



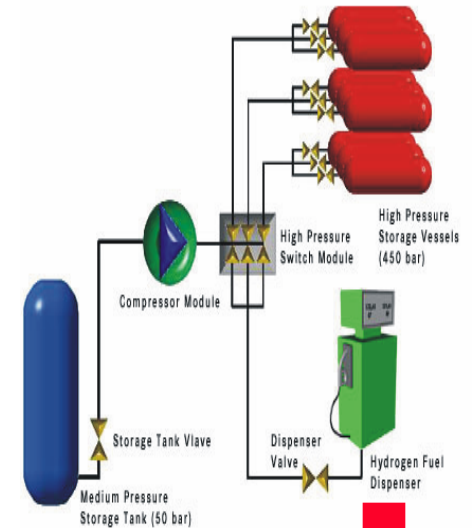
Grid



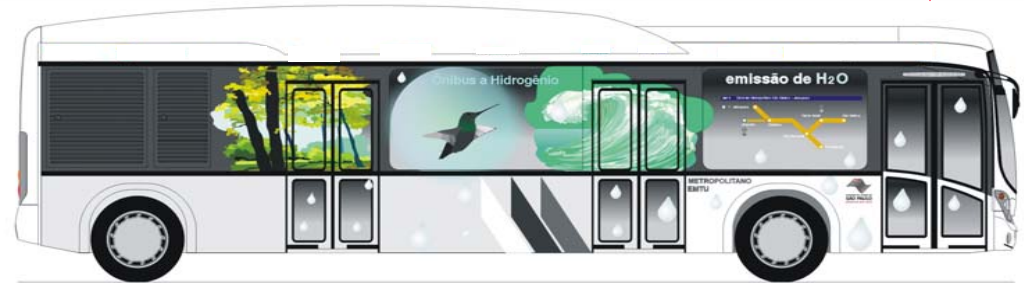
EMTU



Eletrolyser



Refuelling



1ª STEP - OPERATION OF 1 PROTOTYPE

2ª STEP - OPERATION OF MORE 3 OR 4 BUSES





# METROPOLITAN CORRIDOR - SPMR



- Extension: 33km in operation**
- Under Construction: 11km**
- Electrical Extension: 22 km**
- Passengers: 6.0 million/month**
- Fleet: 195 buses**
- Lines: 11**
- Terminals: 9**







# METROPOLITAN CORRIDOR INFRASTRUCTURE



Eletrolyser and  
refuelling area



Bus maintenance  
area



# BUS SPECIFICATIONS



**Size: Padron 12 m / 3 doors**

**Capacity: 90 passengers**

**Air Condition**

**Low Entry / Low Floor**

**Power: 210 kW**

**Range: 300 km**

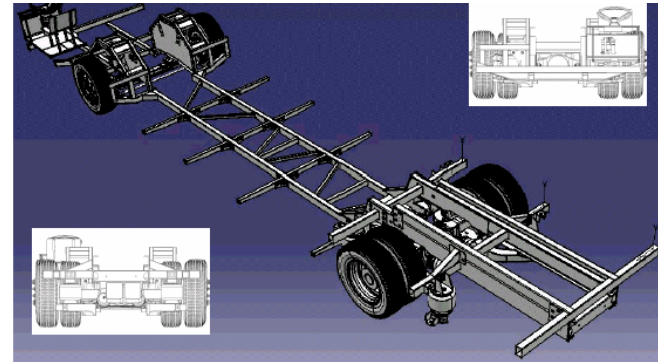
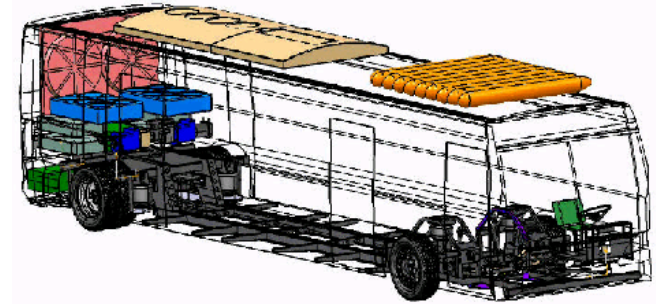
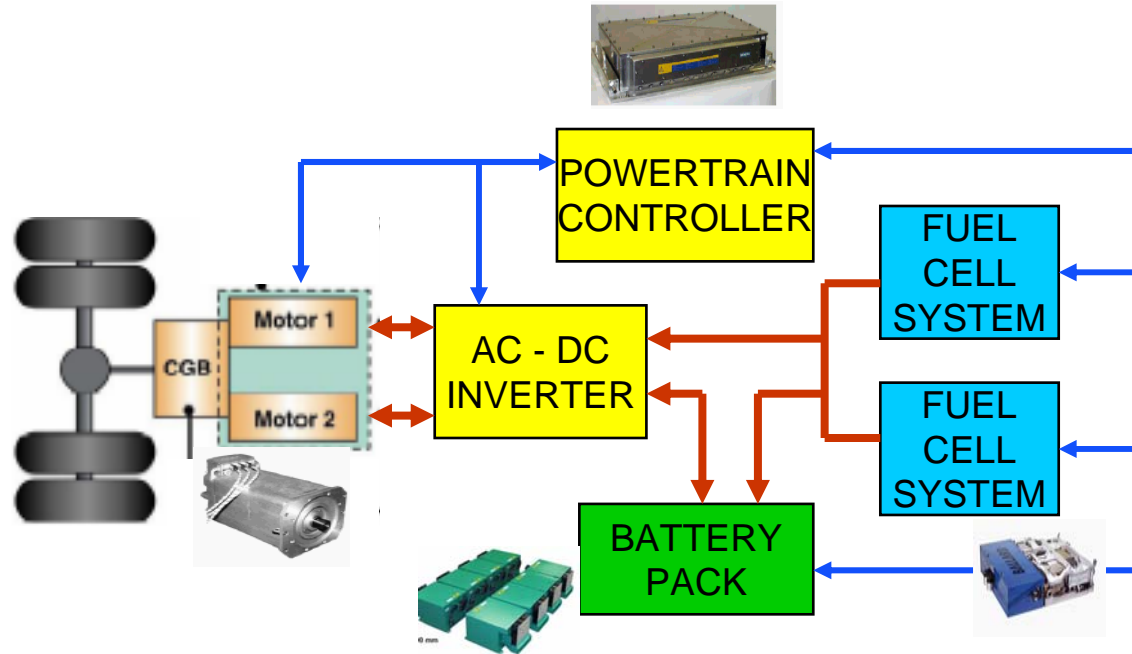
**Consumption H2: 14kg / 100km**







# ADVANCED HEAVY-DUTY CONCEPT

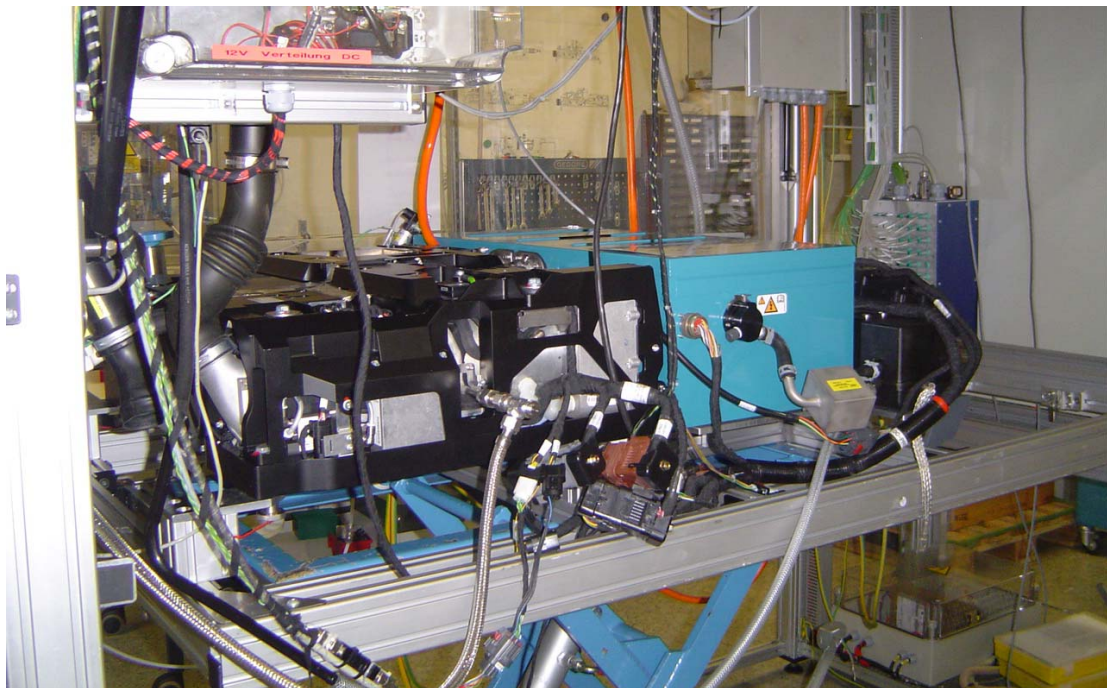


## 2 Fuel Cell Systems + Battery Pack

- Power level → adequate for all drive cycles
- Hybridization → more efficiency, less H2 consumption, energy recuperation
- Bus operation mode → increase lifetime of fuel cell, redundancy



# FUEL CELL TESTS







# BODY / CHASSI







THANK YOU