ITALIA
Agenzia per la promozione all'estero e l'internazionalizzazione delle imprese italiane
(in gestione transitoria)

I T A L Y D A Y

ABSTRACT TABLE OF PROJECT PROPOSAL

PROJECT Nr. 7

SECTOR:	HYDROGEN TECHNOLOGY, ELECTRO MOBILITY, HYBRID VEHICLES
PROJECT IDEA IN A HEADLINE:	A HYBRID VEHICLE POWERED BY HYDROGEN AND AMMONIA
INNOVATIVE POINTS:	A NEW WAY TO USE AMMONIA AS FUEL FOR ELECTRO MOBILITY AND HYBRID VEHICLE
POTENTIAL BUSINESSES AND APPLICATION FIELDS:	SMALL FLEETS FOR PASSENGERS TRANSPORT, SHUTTLES IN AIRPORTS, HOSPITALS, WASTE RECOVERY , ACCESS TO HYSTORICAL PART OF CITIES, SMALL POWER VEHICLES
CHARACTERISTICS OF POTENTIAL PARTNERS:	REGIONS AND MUNICIPALITIES, AUTOMOTIVE AND COMPONENTS SMEs, UNIVERSITIES, CENTRES OF EXCELLENCE, AMMONIA PRODUCERS
EU PROGRAMMES TO PARTECIPATE:	GREEN CARS , RESEARCH FOR SMEs, TO BE DEFINED WITH PARTNERS

BRIEF PROJECT DESCRIPTION:

A partnership of Research and Industry entities has developed a fully working hybrid electric vehicle equipped with a 15 kW IC engine fuelled with liquid ammonia as range extender of the lithium batteries pack on board. All the vehicle power train, i.e. the IC engine, the electric generator coupled with the engine, the electric motor, the electronics etc. has been studied and designed.
As known, ammonia combustion is characterized by an high activation energy and a low flame velocity, therefore a small amount of hydrogen is requested as igniter and combustion promoter. The necessary amount of hydrogen is coming from the thermal decomposition of the same ammonia by cracking it at approximately 400℃ inside a special catalyst (purp osely realized within the project) heated by the engine exhaust gasses. The Nitrogen and Hydrogen mixture coming from the cracker is introduced, by an indirect injection, into the intake manifold together with the ammonia.
Ammonia is stored on board inside a tank very similar to the LPG gas tanks, being ammonia maintained in a liquid state at approximately 0.9 MPa. The pipelines had to be resistant to the chemical aggression of ammonia and special part had been used. The combustion of ammonia has as reaction products only water

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and nitrogen oxides, being these last ones easily removable by means of a catalytic system (SCR) helped by the presence of ammonia.
However, the use of ammonia for the propulsion of motor vehicles introduces some issues on safety, because of the chemical-physical characteristics of the substance. Ammonia is moreover a toxic gas whose ways of penetration in the human organism can be: inhalation, ingestion and contact. This is why a complete work package of the project has been given to safety, building up a sensors system in order to detect presence of ammonia in the local of the engine and in the exhaust system. This kind of vehicles for transport with series hybrid propulsion (vehicle electrical worker fed from batteries charged by an ammonia generator) would allow to have ZEV ("Zero Emission Vehicle") and stationary generation devices fuelled with ammonia turn out interesting also for the storage of energy coming from renewable sources (wind, photovoltaic, etc.) which actually use grid as storage system.