HYDROGEN ROAD MAP IN ITALY

PHASE TWO

Pierpaolo Garibaldi – Ministry for Environment and Territory Italy
Agostino Iacobazzi and Raffaele Vellone – ENEA - Italy

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Main objectives for the H_2 economy in Italy

- H_2 allows the CO_2 reduction for the same amount of energy supplied to the market
- H_2 improves air quality in cities
- H_2 makes environmentally sustainable coal and tar
- H_2 fosters the development of new technologies for the exploitation of renewables with higher efficiency and lower cost

H_2 Roadmap in Italy

- 2002- 2007 Phase Zero: BASIC RESEARCH NATIONAL PROGRAM
- 2004-2005 Phase One: THE VISION
- 2005- 2012 Phase Two: PRIORITY R&D, PILOTS, DEMOS, EDUCATION, ACCEPTANCE, LEGISLATION, ECONOMICS, MARKET.
- 2007 – 2040 Phase Three: INDUSTRIALIZATION

2002- 2007: Phase Zero
BASIC RESEARCH

35 project proposals have been presented on H_2 and FC

- 14 approved (8 on H_2, 6 on FC)
- total cost 128 million euros
- total funding 90 million euros
- more than 100 research groups from university, research institutes and industry involved.

2004- 2005: Phase One
THE VISION

- We do not plan to reinvent the old projects of world-wide H_2 economy based on HT nuclear reactors and on hydroelectricity in Orinoco and Amazzonia rivers with H_2 liquid moved everywhere by vessels
- We do not plan to build up a new system in competition with natural gas (H_2 in all houses)
- We do not plan to completely substitute gasoline and diesel in trasportation
- We plan to produce as much H_2 as needed to mitigate CO_2 through H_2 hubs where H_2 is produced and used most effectively at the lowest possible cost

Vision guidelines

PRODUCTION: fossils and direct renewables

LOGISTIC: pipelines

UTILIZATION:

- power gen through CC in centralized plants H_2 turbines 300-1000 MW
- distributed energy production through H_2 fuel cell 1-10 MW
- H_2 fuel cell city cars
- H_2 fuel cell city busses (40 and 80 seats)

Fossil H_2 production
NG – TAR- COAL

Technologies already available and improvements expected by technology providers

CRUCIAL: CO_2 GEOLOGIC STORAGE IN SITES AT ZERO RISK FOR THOUSANDS OF YEARS

ACTIVITY IN PLANNING:

- geological survey of the national territory
- geo chemistry, geo physics and modeling of the best geo sites
- pilot projects with already available CO_2
- demo projects with CO_2 derived from new demo H_2 production plants

Renewable H_2 production

Not to be considered the already commercially available technologies (photovoltaic, geothermal, wind and hydro) such technologies should be implemented as much as possible for the electricity production (Italy produces 80% of electricity from fossils)

Planned the H_2 production from renewables through new technologies for direct conversion into H_2

H_2 production from direct renewables

HT SOLAR: pilot project: in progress

LT SOLAR: water biophotolysis: basic in progress- water chemical photolysis: basic planned

BIOMASS THROUGH GASIF: technology commercially available: pilot/demo in planning

BIOMASS THROUGH FERMENTATION: basic in progress

Logistics

- H_2 production site next door to power plant
- minimum distance production – market
- minimum distance CO2 production – CO2 storage
- no liquid H_2 through tanks on road
- no compressed H_2 with pressurized bottles through truks on road
- pipelines wherever possible

Utilization

- Centralized power gen through H_2 turbines
- Distributed energy production (electricity, heating, conditioning) through H_2 FC
- H_2 FC city cars
- H_2 FC city busses

2005 – 2012 Phase Two

- MORE FOCUSED R&D
- PILOTS
- DEMOS
- EDUCATION
- ACCEPTANCE
- REGULATION
- LEGISLATION
- ECONOMICS
- MARKET

2007 – 2040 PHASE Three
A POSSIBLE SCHEDULE

- 2007 - H_2 FROM BIOMASS GASIFICATION
- 2012 - H_2 FROM FOSSIL WITH CO_2 GEOLOGICAL SEQUESTRATION
- 2020 - H_2 FROM SOLAR HT
- 2030 - H_2 FROM WATER PHOTOLYSIS (BIO AND/OR CHEMICAL)
- 2040 - H_2 FROM BIOMASS FERMENTATION

PhaseTwo: EDUCATION THROUGH PILOT ACTIVITY H_2 PARKS an effective public – private partnership

- Hydrogen Systems Laboratory, Turin- Piedmont
- Bicocca Project, Milan – Lombardy
- Zero Regio Project, Mantova – Lombardy
- Arese Project, Arese – Lombardy
- Hydrogen Park, Marghera (Venice) – Veneto
- HBUS, Florence – Tuscany
- Arezzo Project, Arezzo – Tuscany
- HigHValley, Abruzzo