H2 Activities and Programs in Italy
Country report

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IPHE SC Meeting
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Italy outlook

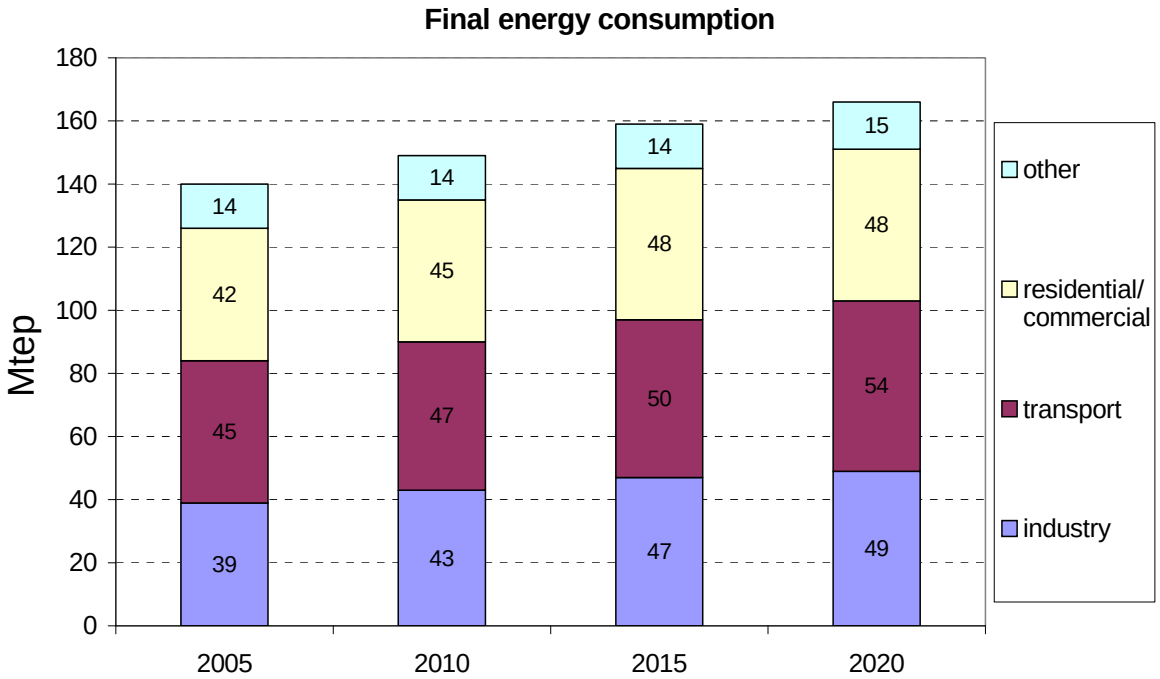
Decreasing population, but sustained per capita income guarantees the economy size…

	2005	2010	2015	2020
Population (million)	57.5	56.4	55.2	53.9
GDP (US$bn 1995)	1230	1431	1588	1736
GDP/capita (US$/capita)	21407	25374	28739	32225

Source: Wood Mckenzie, 2003

Economy tightly linked with energy services ..

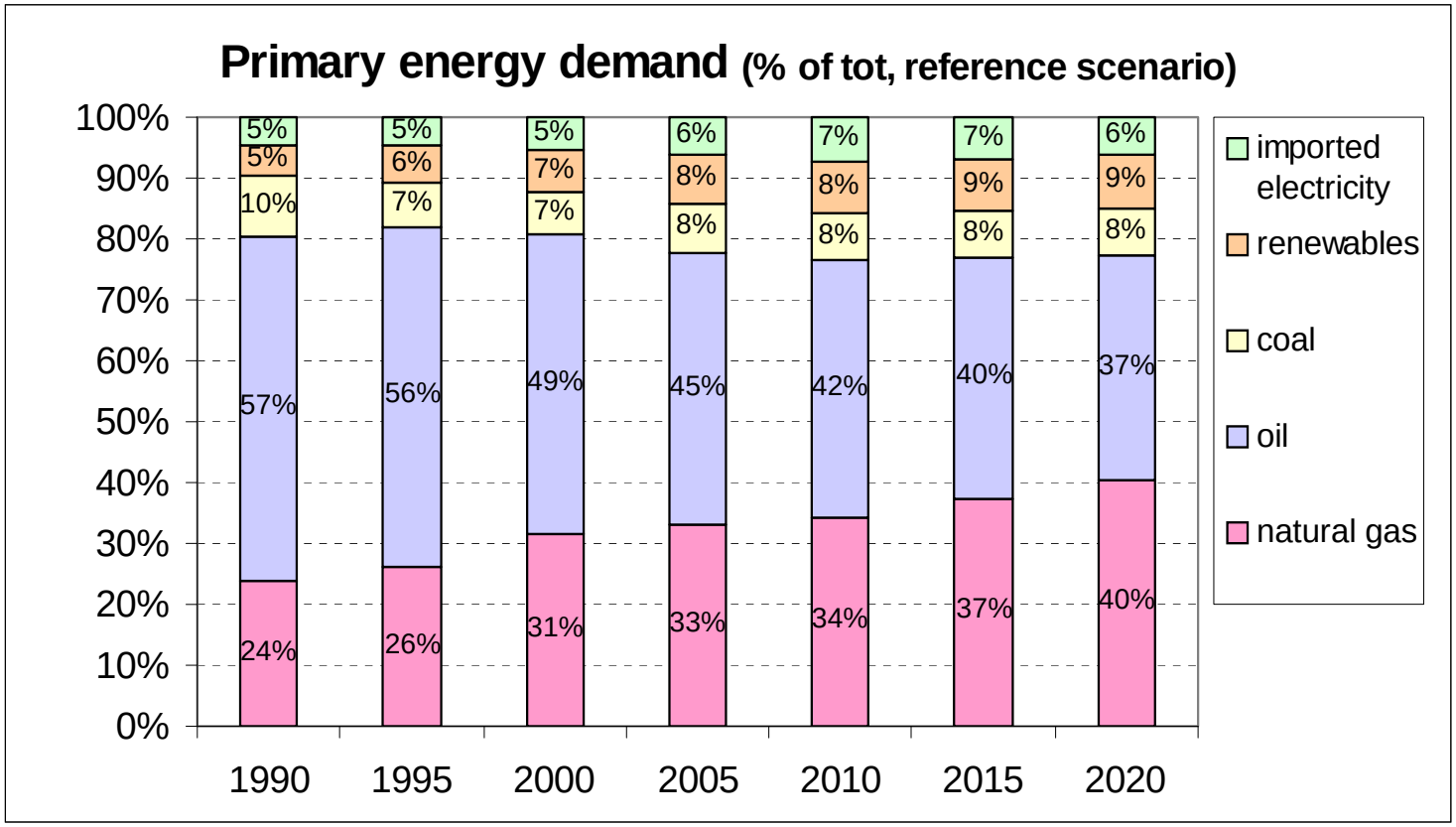
..energy consumption continues to grow, equally shared among industry, transport and residential.



Source: ENEA, Rapporto Energia e Ambiente 2004

Energy consumption

Energy demand implies continual use of fossil fuels …



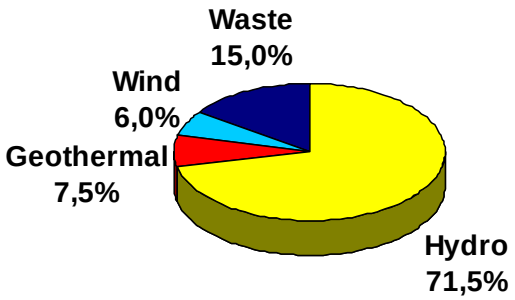
Source: ENEA, Rapporto Energia e Ambiente 2004

Renewables

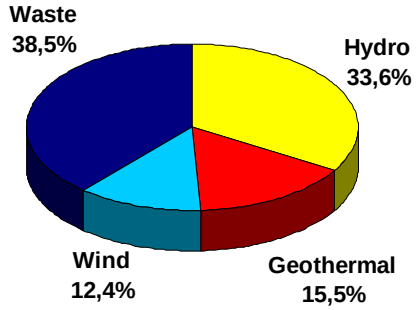
… though renewables will be called to play an increasing role in the power generation …

Operating plants

power: 3.747 MW

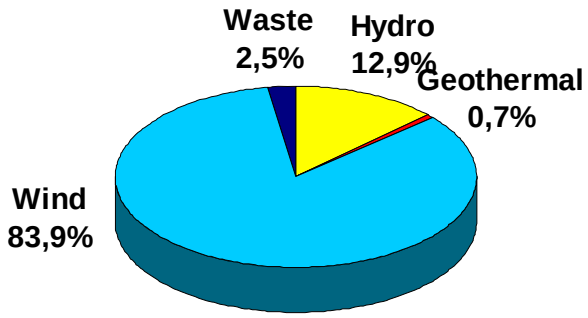


production: 4.112 GWh

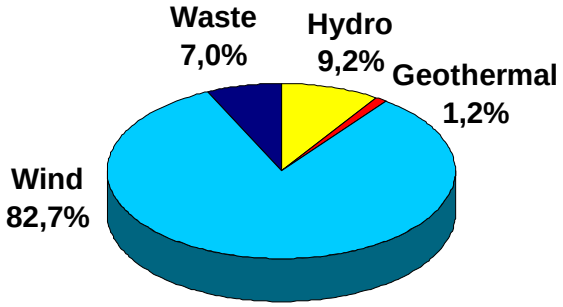


Planned NEW plants

power: 4.894 MW



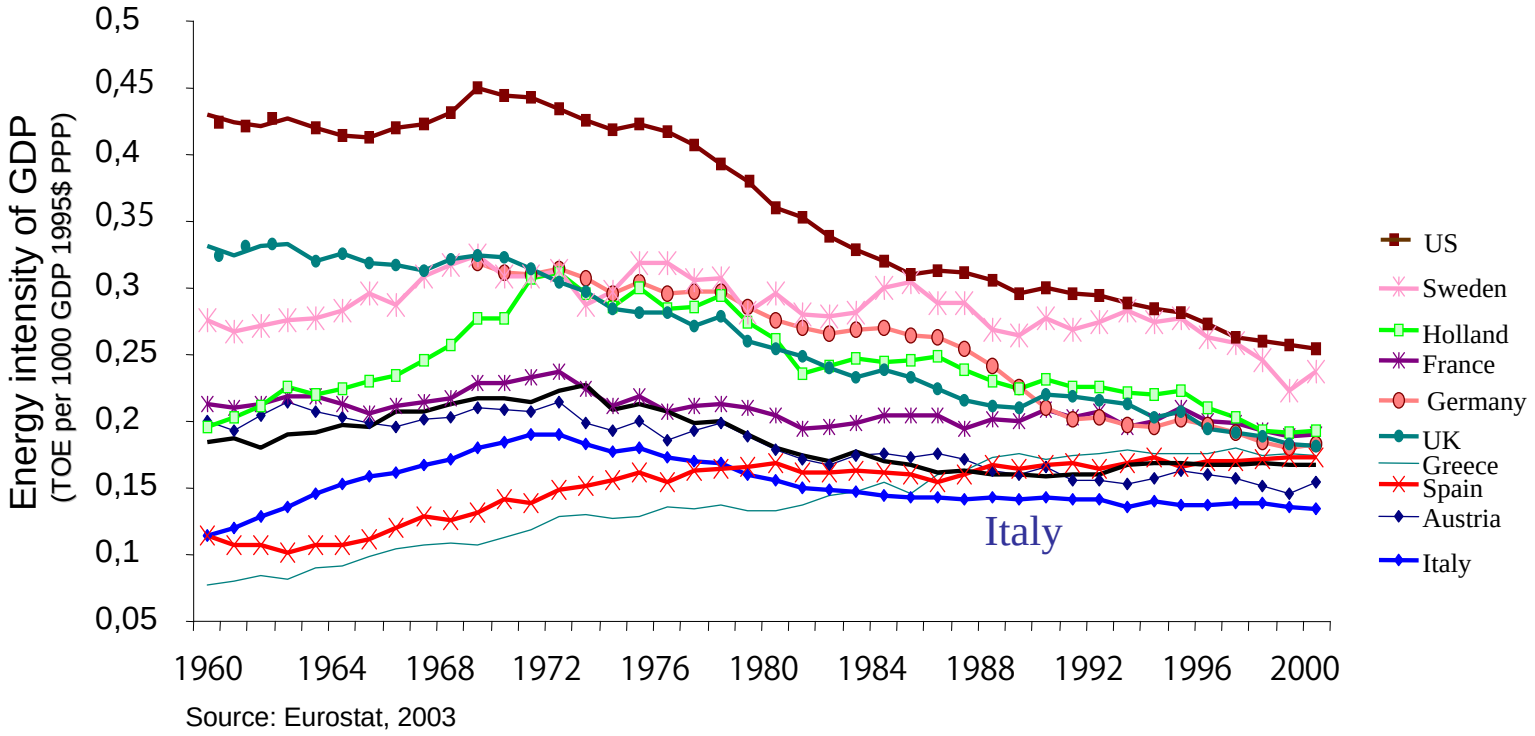
production: 12.060 GWh



Source: GRTN, 2003

Energy intensity

…. Italy already an energy efficient country …

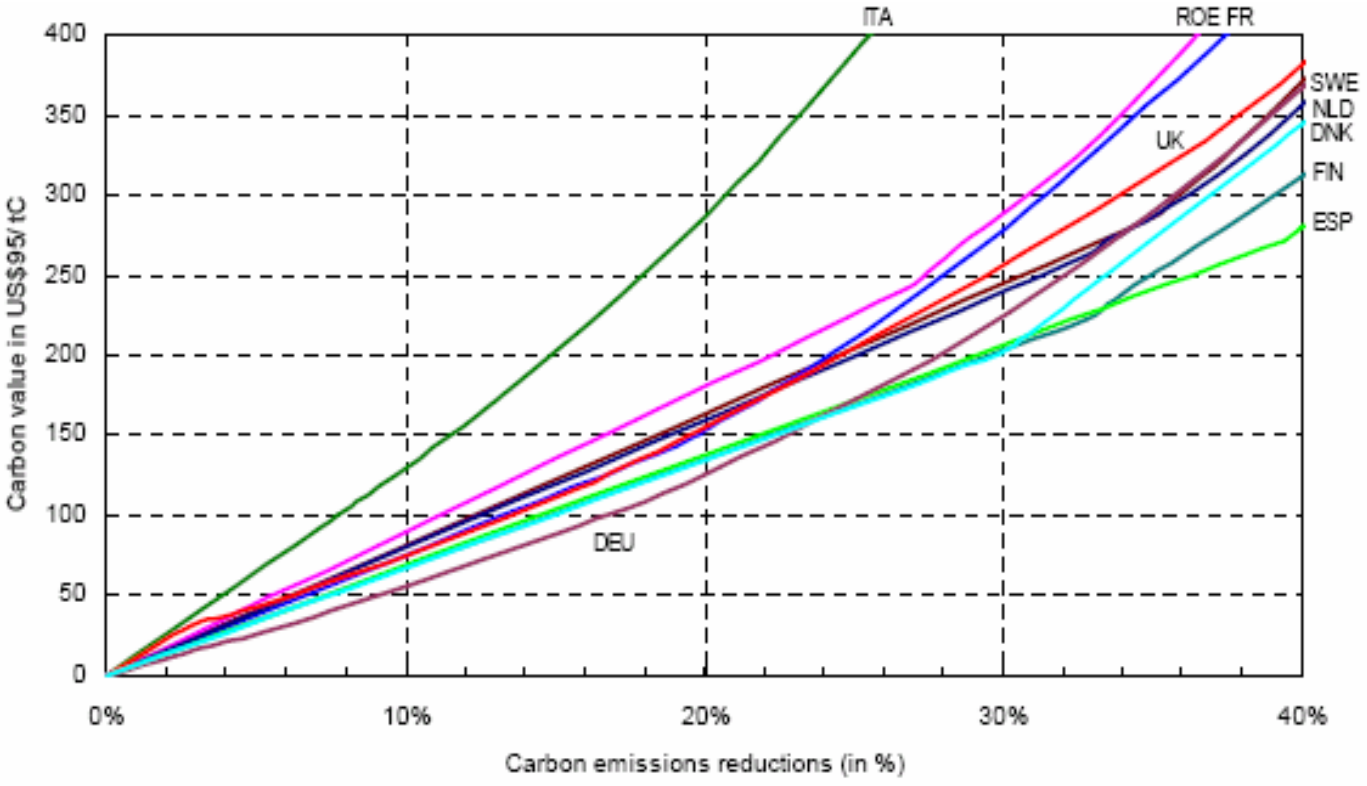


Source: Eurostat, 2003

Marginal Abatement Costs

… facing high marginal abatement costs …

MAC curves, EPPA-EU model

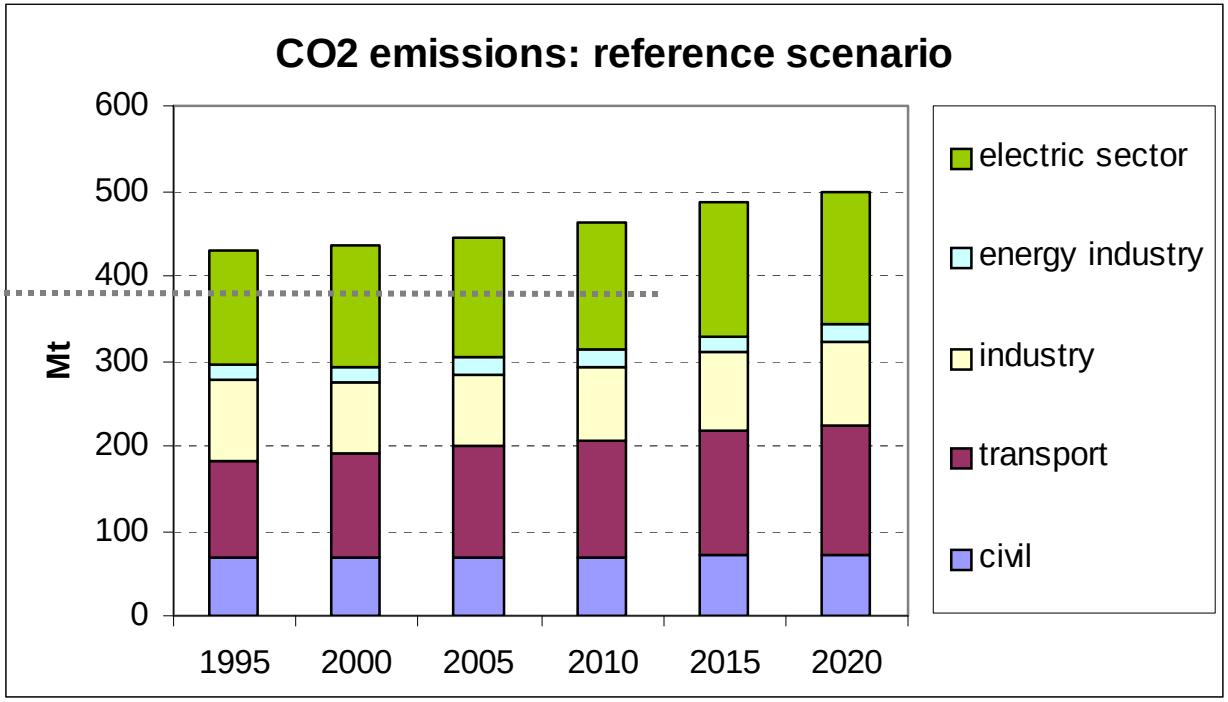


Source: Carbon Emissions and The Kyoto Commitment in the European Union,
Laurent L. Viguier, Mustafa H. Babiker and John M. Reilly, MIT

Climate change

…preventing climate change needs Green House Gases (GHG) emissions target

KYOTO TARGET



Source: ENEA, Rapporto Energia e Ambiente 2004

- Kyoto Protocol requires Italy to cut emissions 6.5% below 1990 level: likely reliance on reductions outside the national borders.
- **Transport and energy industry** sectors with the largest emission increase: by 2020 will account for almost 57% of total GHG emissions.

Overall picture

Summing up what we've seen so far:

- steadily growing demand for energy services and electricity …
- … particularly in the transport and energy industry sectors …
- … to be met accounting for climate change and environment protection…

⇒ Innovation in clean technologies needed ⇒ IPHE

Remedies:

- increased use of renewables
- **hydrogen economy**
- energy efficiency

Actions:

- Italy has allocated 90M€ of funding for hydrogen and fuel cells projects through the FISR (Fondo Integrativo Speciale Ricerca) :
  - 14 projects funded
  - 36 institutions involved among Universities, research institutes and private companies
- within the US-Italy cooperation program 18 more M€
- main applications expected to be in:

  1.power production and **2.transport sector**

FISR funded projects

Fuel Cells	Hydrogen
PEFC and SOFC fuel cells: applications and new materials	H2 micro-combustors
Hybrid and inorganic nano-systems for FC	H2 production and storage in nano-materials
Development of a pressurized MCFC system and demonstrative 500kW plant	Innovative H2 production systems from renewables
New MCFC systems for distributed generation	Integrated H2 production systems and utilization in distributed generation
Development of protonic membranes for PEFC applications	H2 production from multi-fuels
	Innovative H2 production from biological processes
	H2 production from petrochemical refinery waste

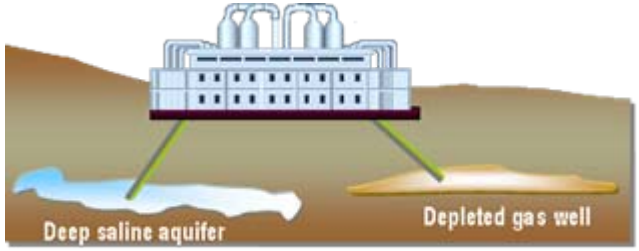
Projects on H2 economy

- FIAT hydrogen car

- FC and micro-turbines development

- Development of systems of production, infrastructure, distribution and storage of H2

- CO2 sequestration and storage: demonstration projects

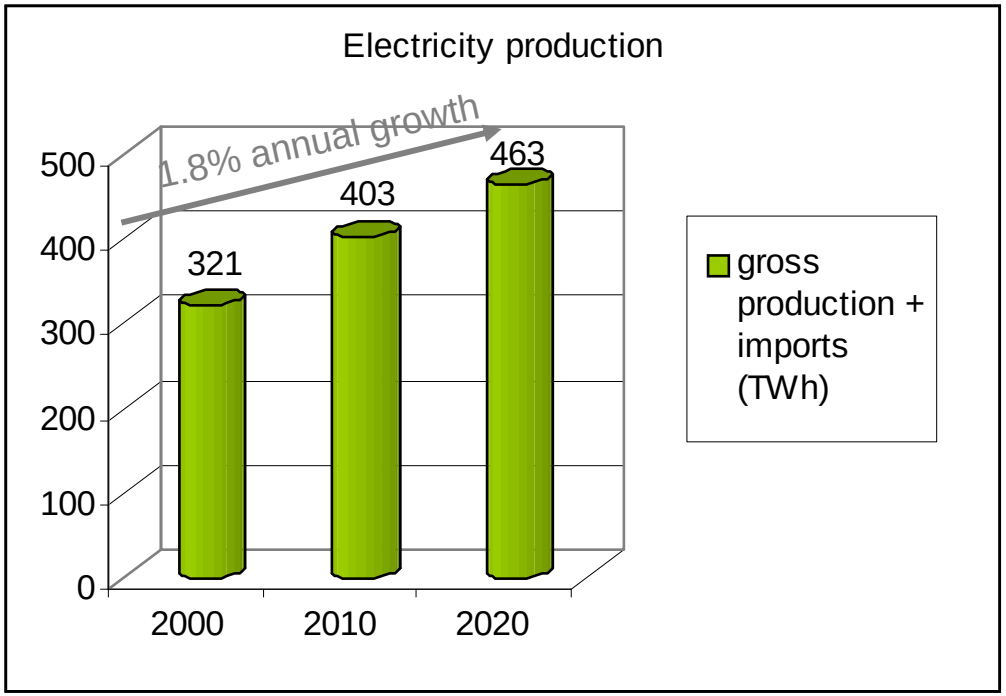


1. Power production

Electricity sector:

• expect strong electricity demand
• important determinant of CO2 emissions

In order to meet the electricity demand and at the same time limit GHG emissions there's a need for innovative clean production technologies:



Source: ENEA, Rapporto Energia e Ambiente 2004

Hydrogen main applications for electricity generation:

- distributed generation – exploiting Fuel Cells high efficiency
- stationary applications – combined with carbon capture and sequestration

Actions:

• FISR-PNR Programme
• Energy law (Sept 2004) incentives for H2
• Carbon sequestration projects and partnerships

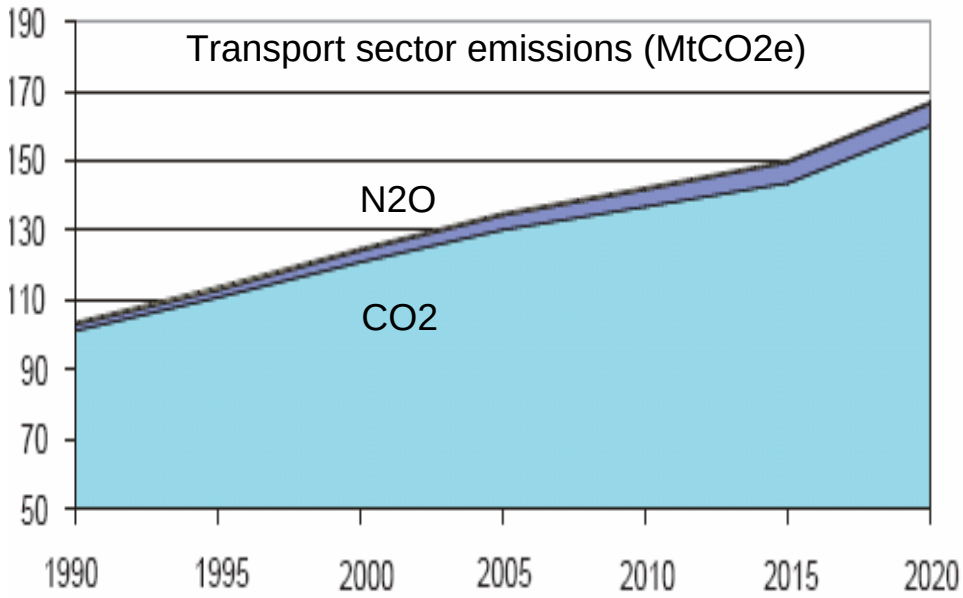
➢ IPHE International Hydrogen Storage Technology Conference, Lucca, June 19-22 2005

2. Transport

Number of vehicles in Italy ('000)

	1990	2002
Motorcycles	2.510	4.037
Cars	27.416	33.706
Petrol	22.502	25.759
diesel	3.600	6.404
other	1.314	1.543
Bus	77	92
Trucks	2.349	3.751
TOT	**33.555**	**42.950**

Source: ENEA, Rapporto Energia e Ambiente 2004



Source: Third National Communication, UNFCCC

Transport sector:

- important emissions determinant
- H2 one of the few options out

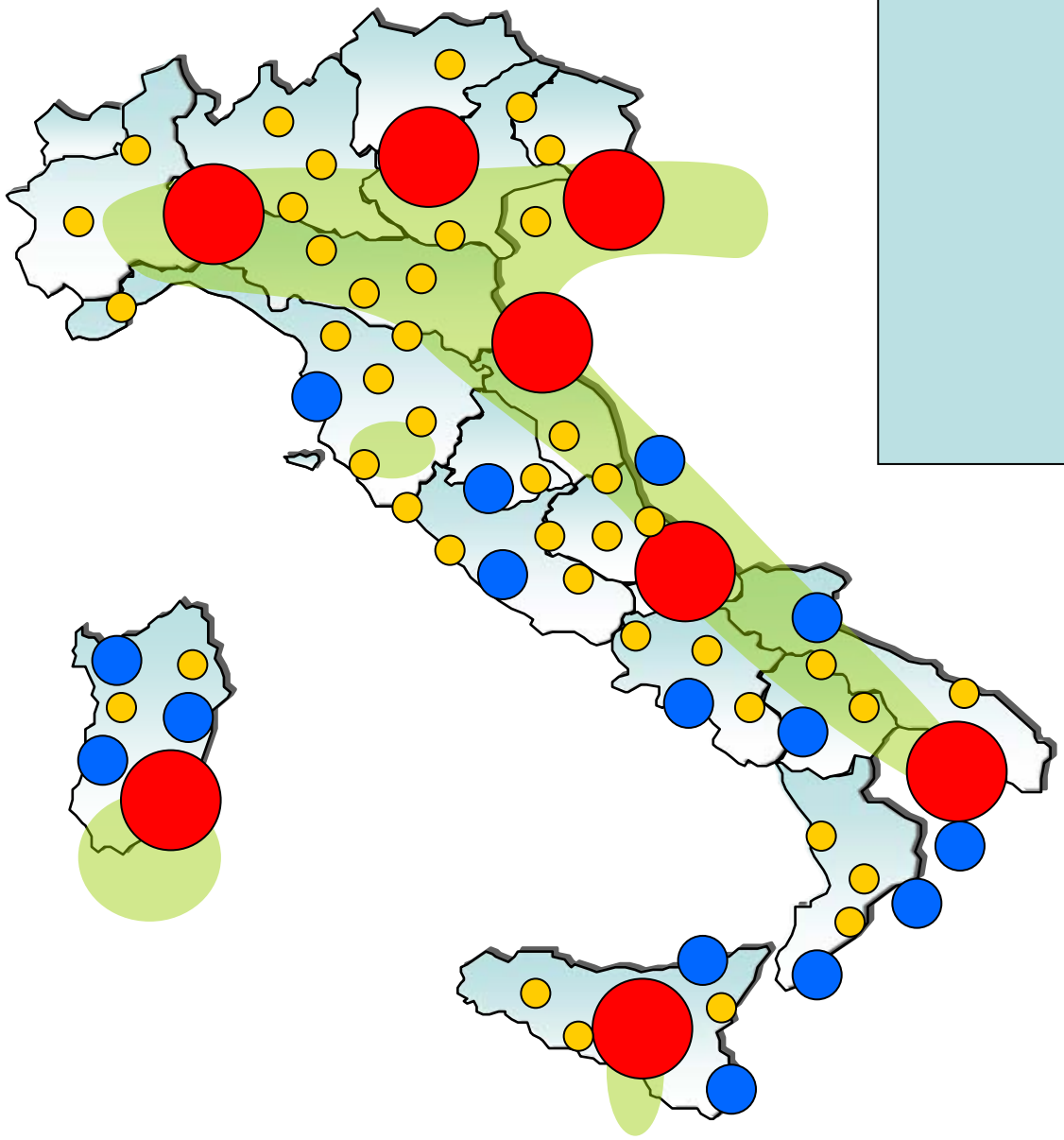
Barriers:

- high infrastructure needs and user commitment

Actions:

- demonstrative projects (medium fleet in H2 transport)
- scientific parks, scientific research
- FIAT 600 H2 car
- H2Bus in Turin

ITALY
H_2 Vision



Possible sites for CO_2 geological sequestration

Hydrogen Hub
Fossil Fuel based

Hydrogen Hub
Solar Energy based

Hydrogen Hub
Biomass based

Hydrogen Hub Fossil Fuel based

Power generation
560 MW

Coal

Oil

Gas

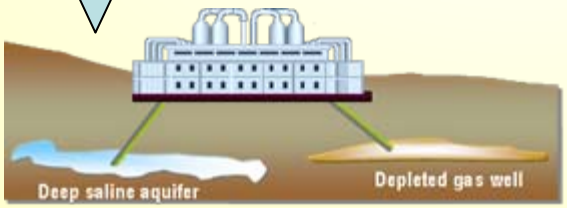
Hydrogen vehicles
2500 buses
25000 cars

H_2

Hydrogen production plant

Distributed
generation
240 MW

2.3 ÷ 2.7
Mt /year



CO_2 sequestration

Bottom line

- Economic growth and energy are mutually dependent
- Need for an environmentally friendly energy policy satisfying the global energy requirements while reducing GHG emissions.

The IPHE represents for Italy an important tool for reaching the following objectives:

• a broad long term strategy, involving both developed and emerging economies, in an effort of **research & innovation** and energy policies, to reduce the “carbon intensity” of the economy through the development of new energy systems

• making the new **clean and safe energy sources and technologies** available and cost effective, to address both the energy security and the emissions reductions

• promoting and disseminating **clean technology innovation** in the energy system, setting common standards and goals for the different technologies