

Potential Market of Hydrogen and Fuel Cells in Spain

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SWH conf. 2003
Segovia. July 2003.



Content:

- Energy dependence
- Renewable Energy Potential
- H2 & FC opportunity
- Interest in H2 & FC (AeH)
- Lighthouse projects
- Conclusions



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Energy dependence

Energy sources (Spain 2001)



Source: IDAE-MEH

A_eH₂

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Situation:

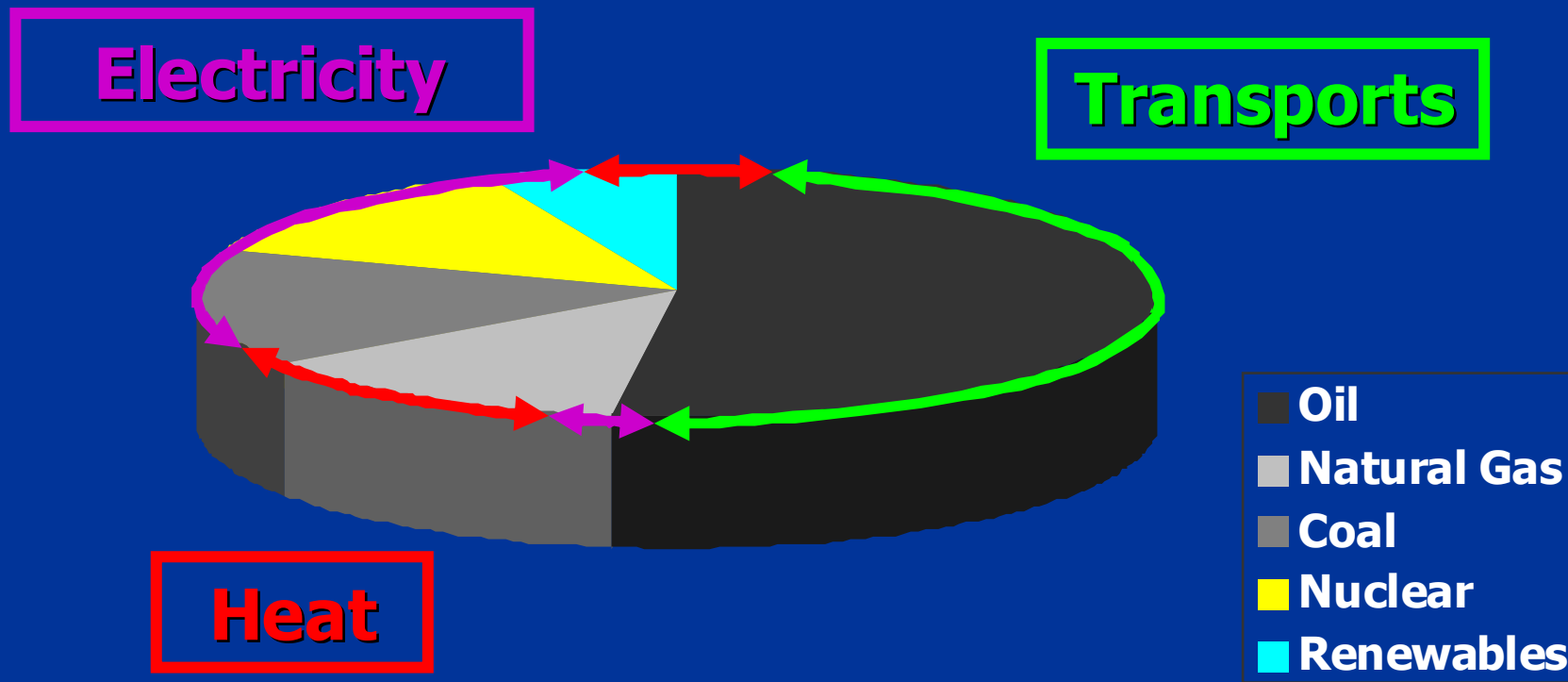
- **Strong energy dependence ($\sim 75\%$)**
- **Fossil fuels predominance**
 - **atmospheric contamination**
 - **limited reserves**



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Use of the energy (Spain 2001)



Source: IDAE-MEH

A_eH₂

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Situation:

- **High consumption of energy in transports**
 - **with low efficient ICEs**
 - **and generating contamination in very peopled areas**
- **Low use of cogeneration**



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Renewable energies potential

Heat:

- **Biomass: ($\sim 3\%$): slowly growing**
- **Thermal solar: slowly growing, great potential**

Electricity:

- **Hydropower: ($\sim 20\%$) no growing potential**
- **Wind: ($\sim 6\%$) very fast growing**
- **Off shore wind: great potential**
- **PV solar: great potential, great economic doubts**



Wind energy:

- 4,8 GW at end 2002
- Growing almost 100% per year
- Concentration in low populated regions:
 - Galicia
 - Castilla-La Mancha
 - Aragón
 - Navarra
 - Castilla-León
- Reaching problems in grid connection,
H2 & FC looks like good complement



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H2 & FC opportunity

- Making rational use of fossil fuels for transports
- Making possible the use of other sources for transports
- Allowing domestic self-cogeneration (electricity + heat) with distribution of NG or H2
- Complementing wind power when grid connection not possible



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Interest in H2 & FC

- H2 & FC in Spanish RTD programs
- Spanish participation in lighthouse projects
- Quite strong impact in public
- Strong needs of formation in H2 & FC
- Creation of the Spanish Hydrogen Association (AeH)



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Members of the AeH (1/2)

Big companies:

- ABELLO LINDE
- AIR LIQUIDE
- ARAGONESAS IND. Y ENERGÍA
- BP ESPAÑA
- CARBUROS METÁLICOS
- CEPSA
- EHN
- ELECTROSUR XXI
- EMPRESARIOS AGRUPADOS
- ENDESA GENERACION
- GAS NATURAL SDG
- GREENCELL
- IRISBUS IBÉRICA
- ISOFOTON
- IZAR
- PRAXAIR ESPAÑA
- REPSOL YPF
- TRANSP. MUNICIPAL. BARCELONA

SMEs:

- AJUSA
- ARIEMA
- CM S.L.
- DAVID FCC
- ELCOGAS
- ELECTRONICA GRACIA
- ENERGY EXPRESS
- EOLICA DE NAVARRA
- INDEX SERV. INGENIERÍA
- INGENIERÍA EPM
- LONJAS TECNOLOGÍA
- MTORRES
- OTSI



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Members of the AeH (2/2)

Energy Agencies:

- IDAE (Spain)
- APEH (Huelva)
- EVE (Euskadi)
- FAEN (Asturias)
- INEGA (Galicia)

Public Research Centers:

- INTA
- CIEMAT

Universities:

- UNIVERSIDAD REY JUAN CARLOS

Technological Centers:

- CARTIF
- CIDAUT
- CIDETEC

Foundations:

- FITSA
- FUNDACIÓN GOMEZ PARDO
- FUNDACIÓN INASMET
- FUNDACIÓN TEKNIKER

Particulars:

- Over 60 persons: researchers and people that believe in H2 tech



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Lighthouse projects

Some key projects:

- **Industrial projects:**
 - H2 production plant: 68.000 Nm³/hour
Tarragona – Carburos Metálicos. 2002.
- **Demonstration projects:**
 - CUTE
 - CITYCELL (H2 & FC buses)
- **Development projects:**
 - FIRST
 - RES2H2
- **Research projects:**
 - Material development for H2 & FC



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H2 & FC Buses demonstration

DaimlerChrysler

CUTE



CITYCELL

Irisbus



Photos: ARIEMA

AeH₂

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H2 & FC Buses demonstration

- Spain is the only country participating in the two projects (Germany is in doubt in CITYCELL)
- Germany and Spain are the only countries with more than one city participating
- CUTE and CITYCELL will share the H2 filling station at Madrid
- The first CUTE bus in regular operation ran at Madrid
- The first CITYCELL bus in regular operation will run at Madrid or Torino



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Conclusions

- Great interest in Spain – good opportunities
- Rational use of fossil fuels
- Renewable (or nuclear) clean production
- Long-term H₂ & FC market introduction
- Will create employment (~100 at 2002, at growing rate)
- Different niche markets:
 - Transport
 - Residential cogeneration
 - Remote systems with renewables
 - Portable equipment



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More info

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