

Hydrogen Activities in The Netherlands, with focus on Rijnmond Region



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SenterNovem &

Netherlands Platform for Sustainable Mobility



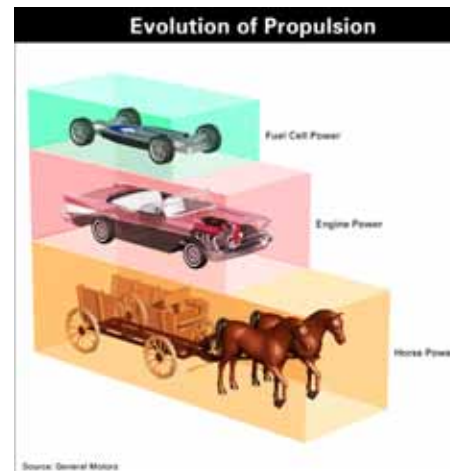
Workshop

Supporting Regions to Integrate Hydrogen

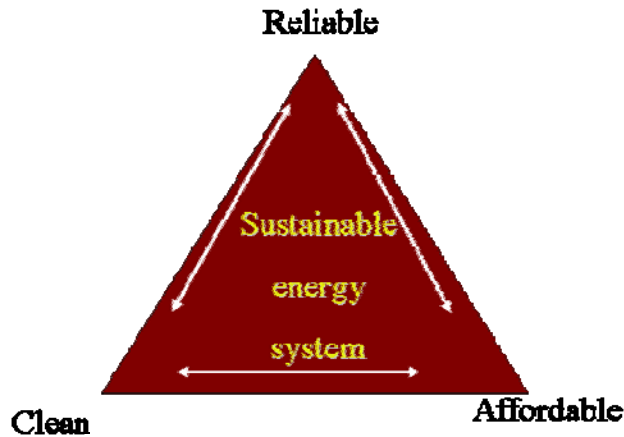
Brussels, Wednesday 4th October 2006

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Energy Transition Policy towards 2050



Objectives for Energy system in 2050 (and earlier):

- **Reliable**
- customer demands; national/regional security of supply
- **Clean**
- climate neutral, reduced health hazards, socially acceptable
- **Affordable**
- minimal social costs, economically efficient

Classic policy

- Technology push
- Top-down
- Single issue
- Blue-print

Transition policy

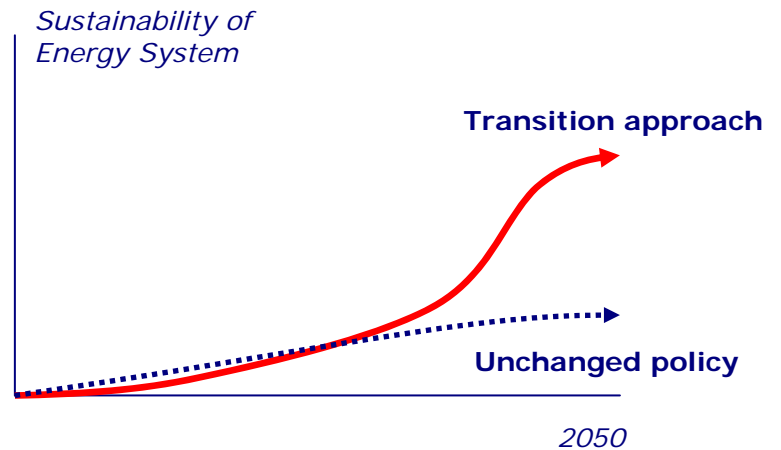
- Technology, community
- Networking, stakeholders
- Multifocal: what's in it for you?
- Learning by doing, experiments

Process

Results

Incremental change

System change



Energy Transition: market and government interaction

Six public-private Platforms:

- Voice of market
- Develop and support experiments and projects
- Improve the strategic transition pathways
- Spot policy, legal, institutional barriers and propose solutions
- Enhance market commitment

Counterpart to Interdepartmental Programme Directorate:

- Economic Affairs
- Public Housing, Spatial Planning and Environment
- Transport and Public Works
- Agriculture and Fisheries
- Finance
- Foreign Affairs



Green and Efficient Gas

Sustainable Mobility

Industrial Chain Efficiency

Renewable Electricity

Green Feedstocks

Energy in built environment

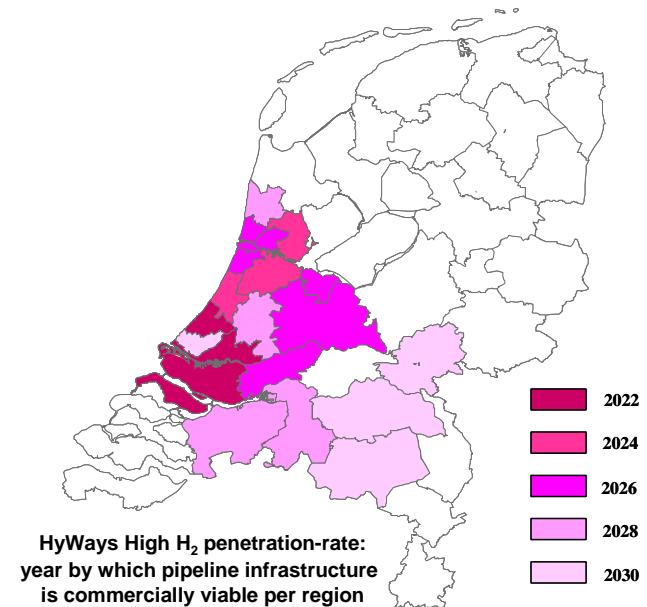
Who's in the platforms? (selection)



Hydrogen Vision for The Netherlands

Vision building takes place in HyWays, Energy Transition WG Hydrogen, and university project H₂ dialogue

- **Mobility** provides main market for hydrogen, but also opportunities for stationary applications
- **Natural gas** will (continue to) play a dominant role as feedstock, but declines after 2030
- Decentralised SMR will be the **on-site** hydrogen production technology in this timeframe
- **Pipeline infrastructure** is necessary to achieve further objectives of introducing hydrogen (CCS, renewable hydrogen)
- **LH2 and on-site SMR** provide hydrogen for fuelling stations where pipeline is not (yet) available
- **Mixing H₂ in** natural gas pipelines enables quick growth of H₂ volume (overflow, and greening of gas incentive)
- Hydrogen pipeline infrastructure will **grow from existing** (industrial) hydrogen infrastructure in Rijnmond
- Additional hydrogen to feed pipelines initially produced by expanded SMR capacity in Rijnmond (with CCS)
- **Biomass gasification and coal gasification** with carbon capture will provide low carbon hydrogen from 2030
- (Surplus) electricity from **off-shore wind** will be another limited source of renewable hydrogen
- **Regional division** between metropolitan Randstad and less populated eastern/northern part



The case for Hydrogen region Rijnmond

- The aim is to create a positive spiral:
 - Demonstrating the benefits of hydrogen motivates consumers and politics...
 - ... paves the way for follow-up projects ...
 - ... reducing cost and creating investment opportunity (economies of scale, market growth)

- Realise demonstrations where it is practical and where upscaling is achievable

- Rotterdam-Rijnmond:
 - Over 1 million consumers live and travel near to existing hydrogen pipeline infrastructure
 - Rotterdam is confronted with a significant air pollution problem
 - Concentration of knowledge and experience with handling hydrogen
 - Energy Port Strategy: refineries, biomass import and biofuels production, LNG terminal
 - Perspective for roll-out to Randstad metropole including Amsterdam, The Hague, Utrecht (6 mln consumers)

- Therefore: ideal location for demonstrating environmental gain from hydrogen applications

Project examples in The Netherlands

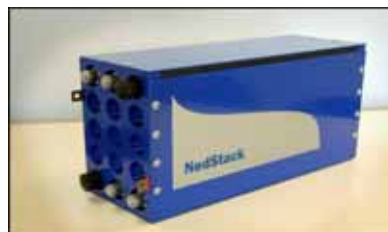
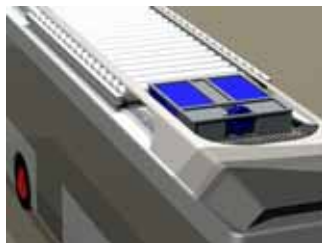
○ Announced projects

- Shell, Connexion, MAN: 25-30 ICE buses in Rijnmond
- Nedstack & partners FC system for buses
- CNG/H2 in The Hague (upgrade of CNG fleet)
- PEMPOWERPLANT 50 MW electricity production from byproduct H₂
- FC canal boat Amsterdam, patrol boat Rotterdam
- Hydrogen for residential area Arnhem

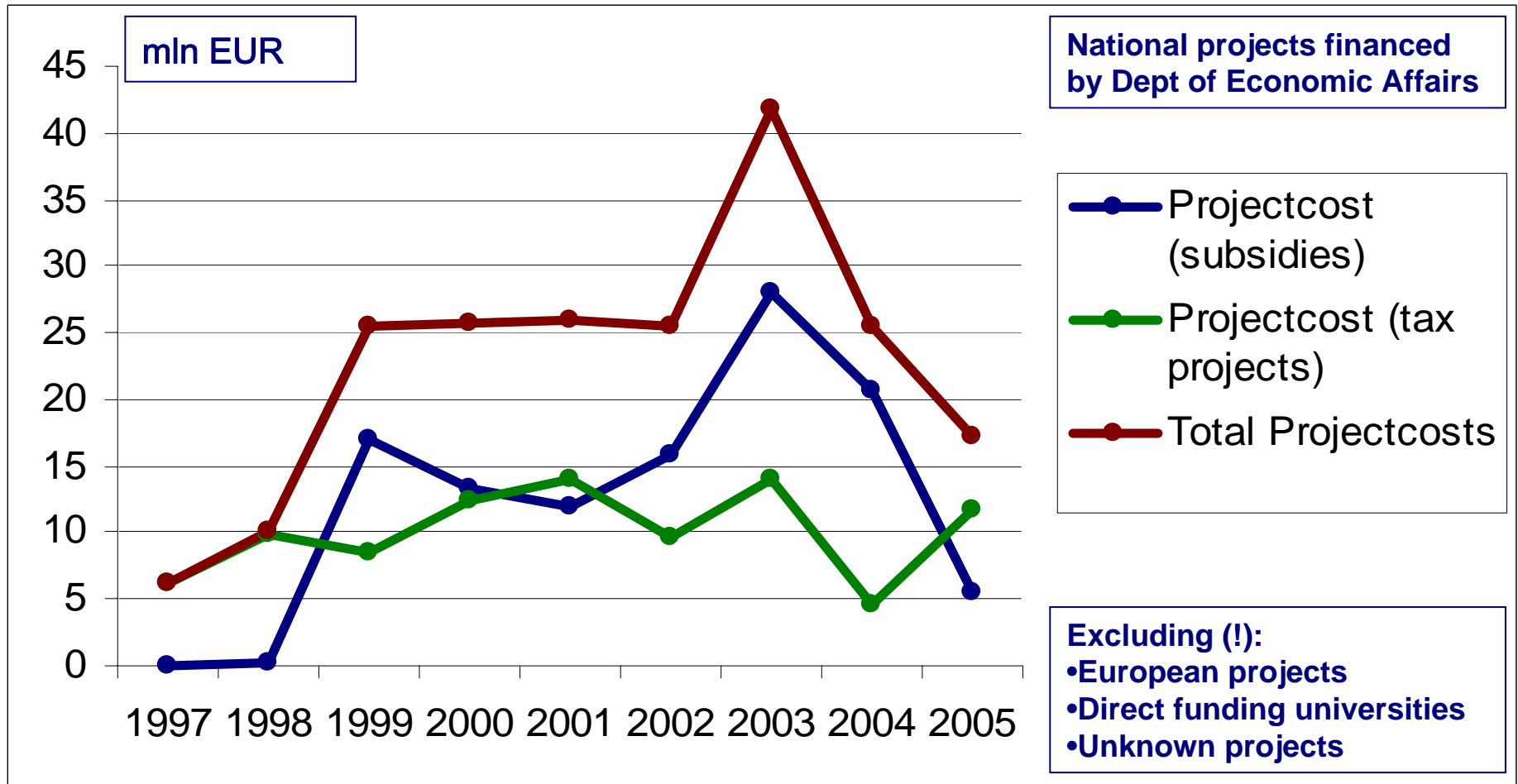


○ R&D programmes

- Biohydrogen
- Hydrogen storage technologies
- Admixture of hydrogen in national NG grid

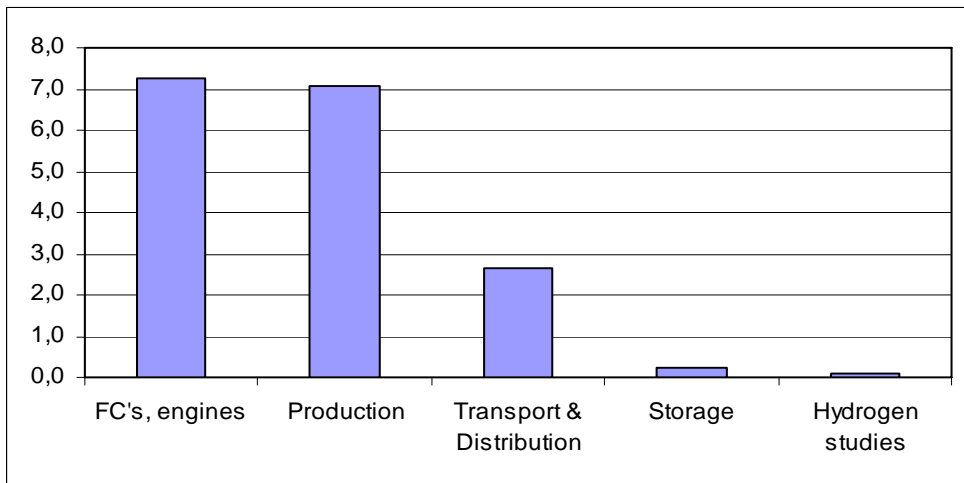


H₂&FC technology project costs in The Netherlands



Note: Tax credit already in place for fuel cell cars

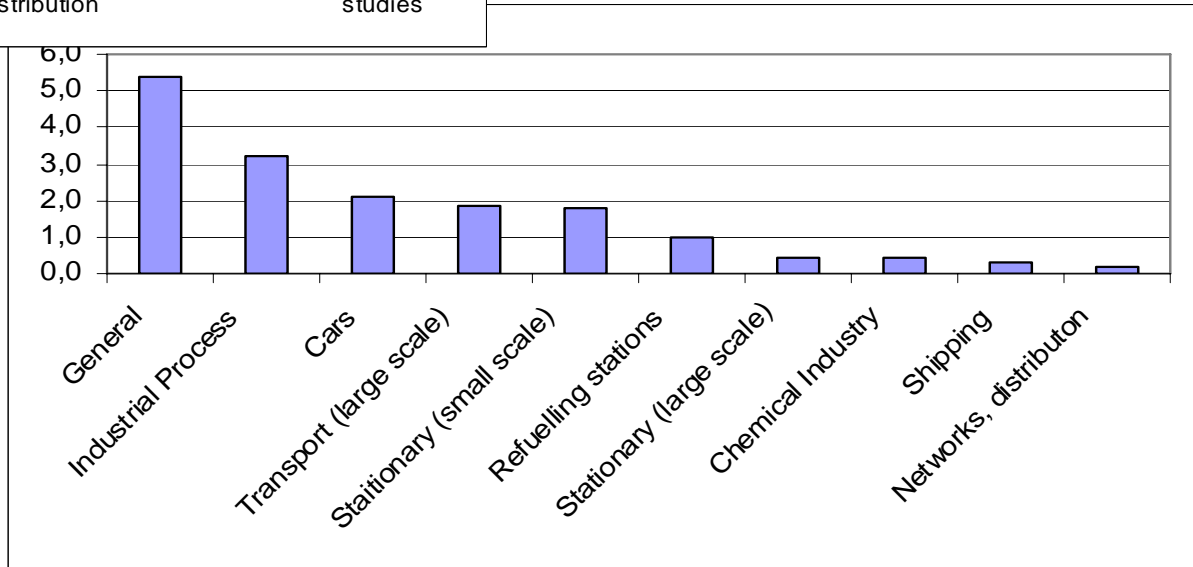
H₂&FC technology: thematic focus



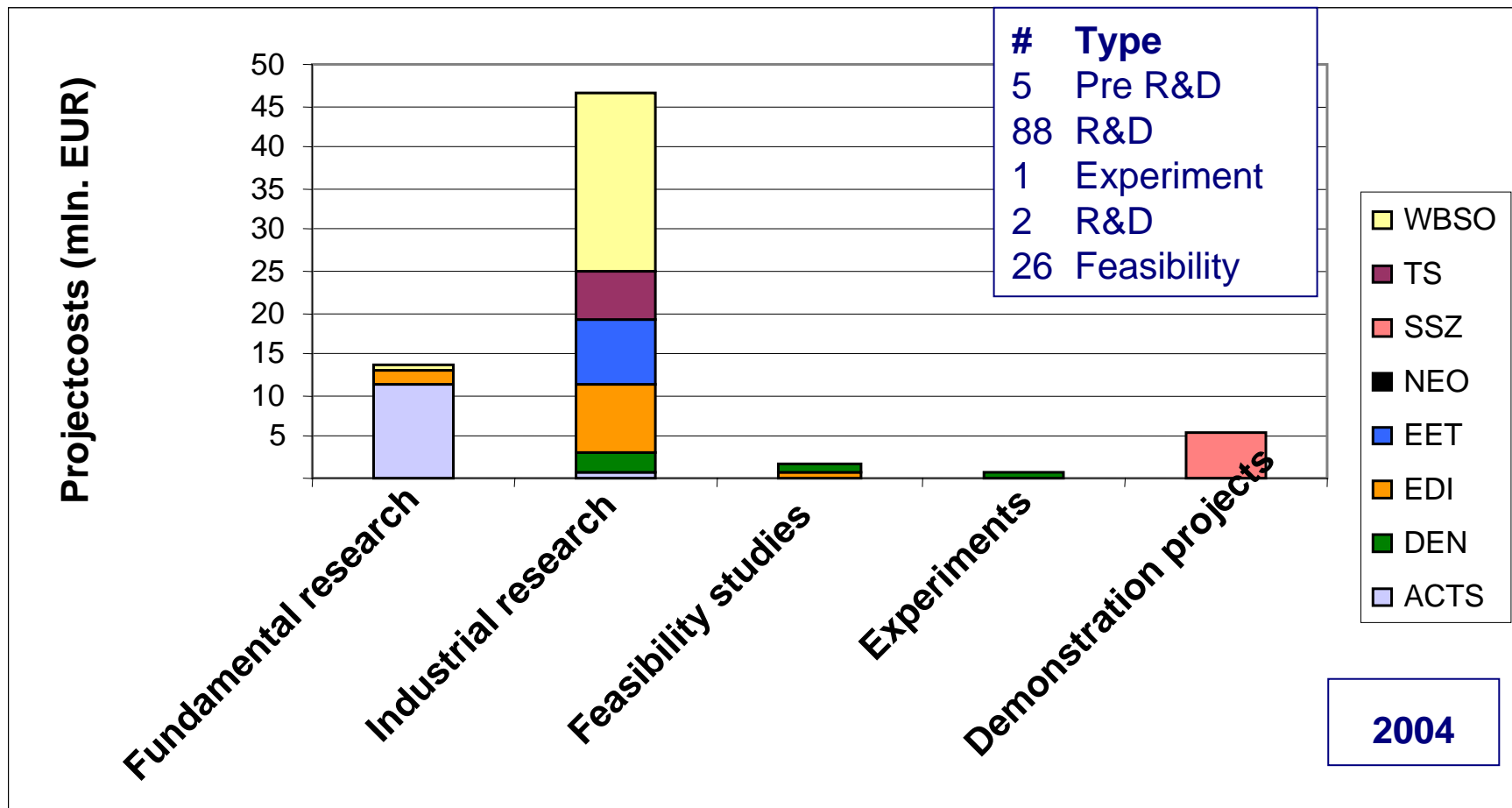
Excluding (!):

- European projects
- Direct funding of universities
- Unknown projects

2005 Project costs
 mln. EUR
 218 projects
 17,4 mln. EUR



H₂&FC technology: increase of demonstration projects



Contact and links

- Contact:
 - Remco Hoogma, r.hoogma@senternovem.nl, tel +31-30-2393768
- Some weblinks:
 - On Energy Transition: <http://www.senternovem.nl/EnergyTransition/Index.asp>
 - On hydrogen and fuel cells innovation:
http://www.senternovem.nl/eos/publicaties/waterstofinnovatie_in_nederland.asp
 - Netherlands Hydrogen Association: www.waterstof.info