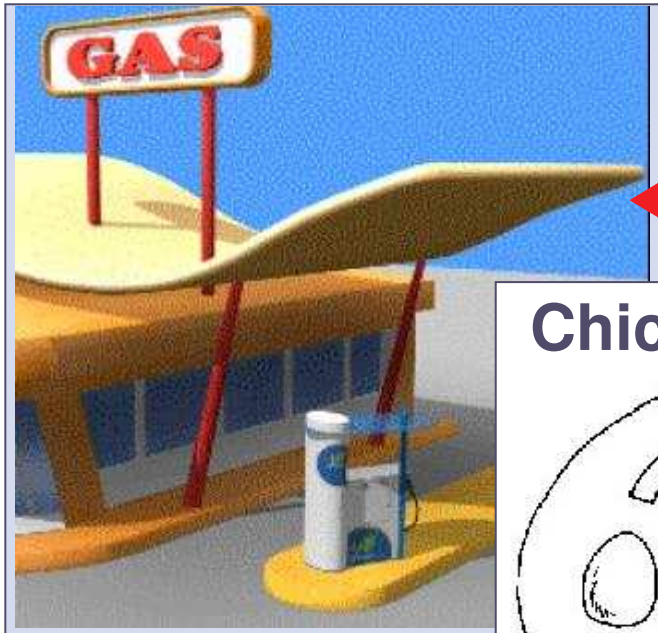
Hydrogen for Transport
Internal Seminar

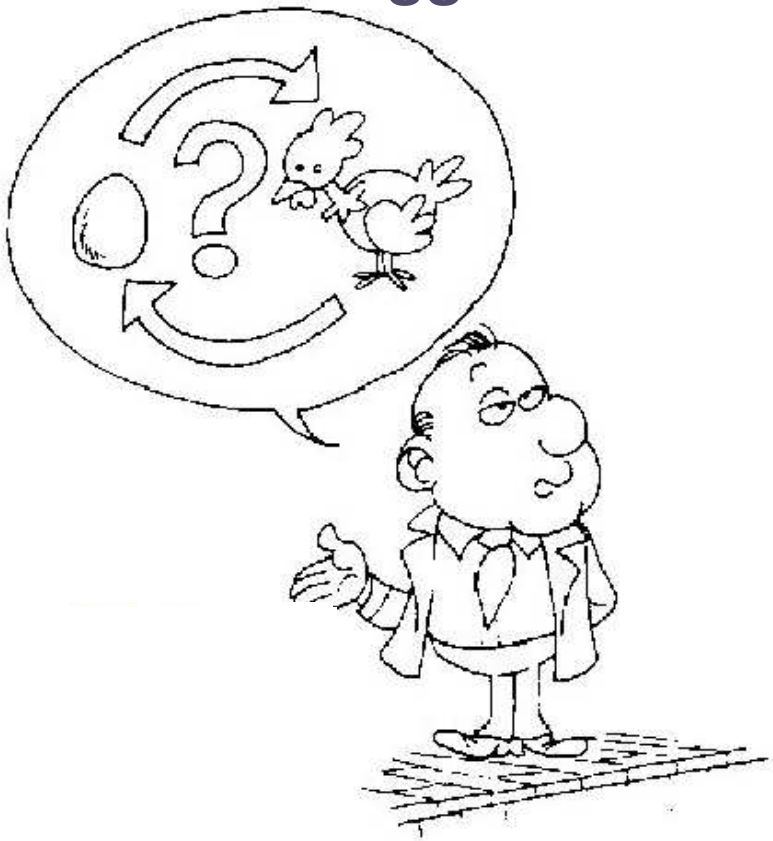
Hychain Project
Hydrogen Infrastructure

European Commission
Directorate General
Energy and Transport
Wednesday 25th January, 2006

Technology development dilemma



Chicken & egg dilemma



Early market strategy

Existing infrastructure

Chicken & egg dilemma

Other niche applications

Early market and niche Transport applications

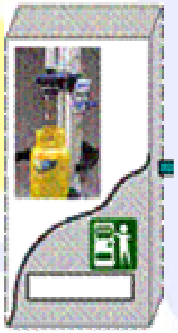
34

40

44

44

2



10

30

148 small vehicles + 10 buses with 3 years demonstration period
More than 2000 High Pressure Bottles 300 bars and 900 bars

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Challenges

- Safe
- Ease of use
- Quickly deployable
- Low cost
- User friendly

Optimize use of existing Industrial Hydrogen Infrastructure

Cylinders

200 bars, 9 m³ GH_2

Hundred of thousands cylinders

Trucks - Trailers

Cryogenic tanks:

-253°C 40,000 m³ GH_2

Tube trailer:

200 bar 2,500 to 6,600 m³ GH_2

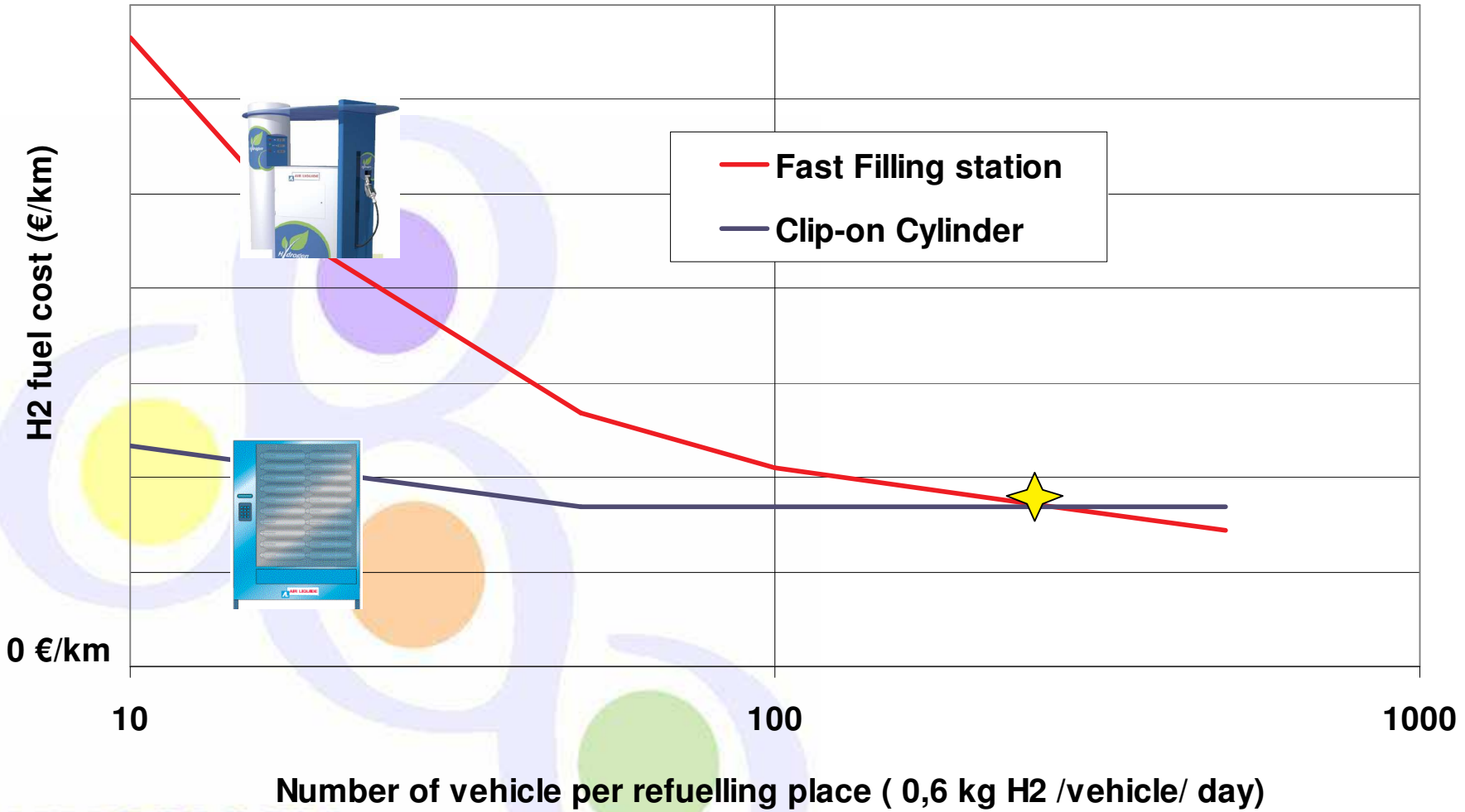
> 1000 trucks

Pipeline

12 networks worldwide

> 1700 km of pipelines

Economic comparison



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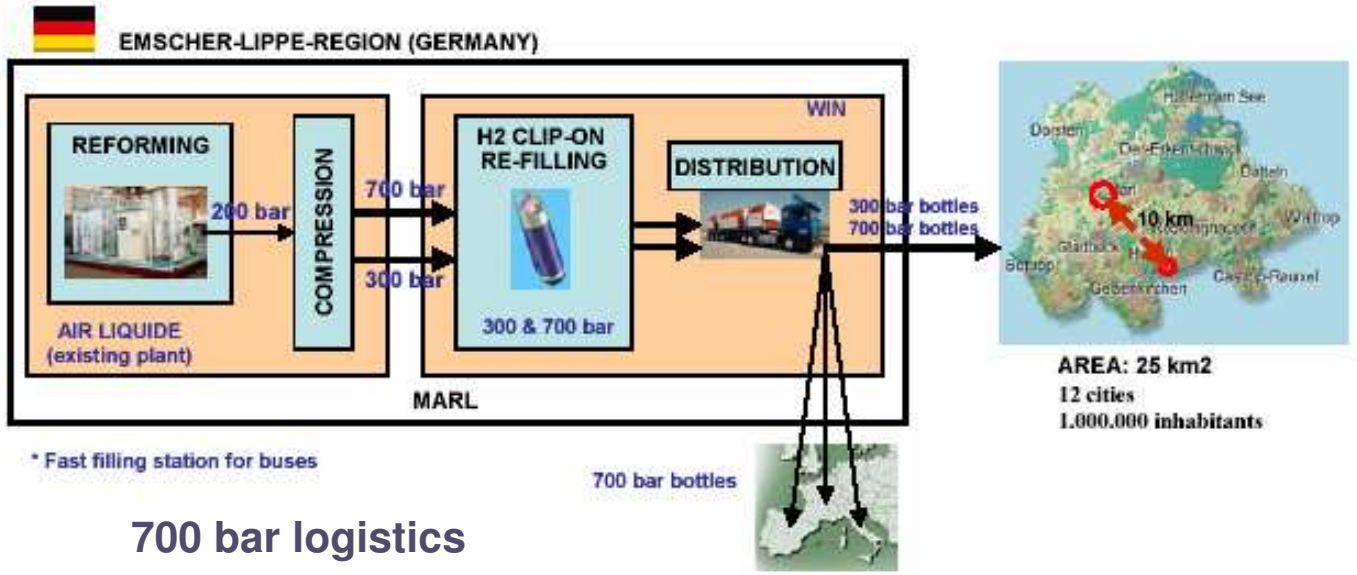
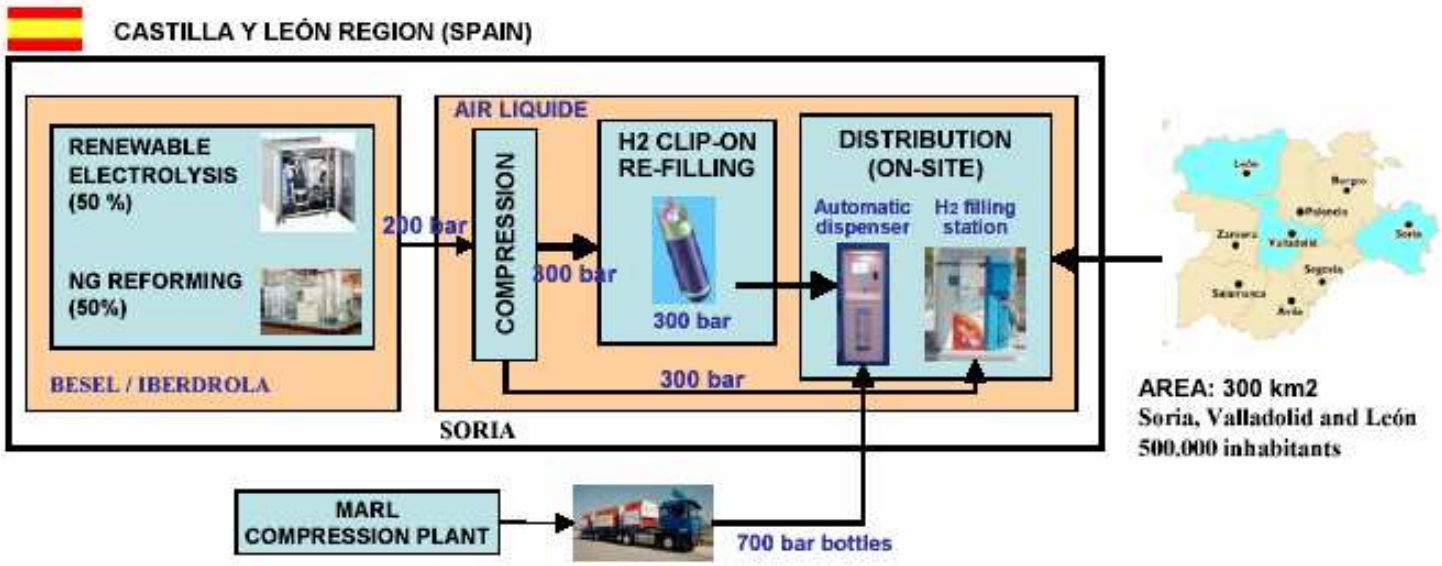
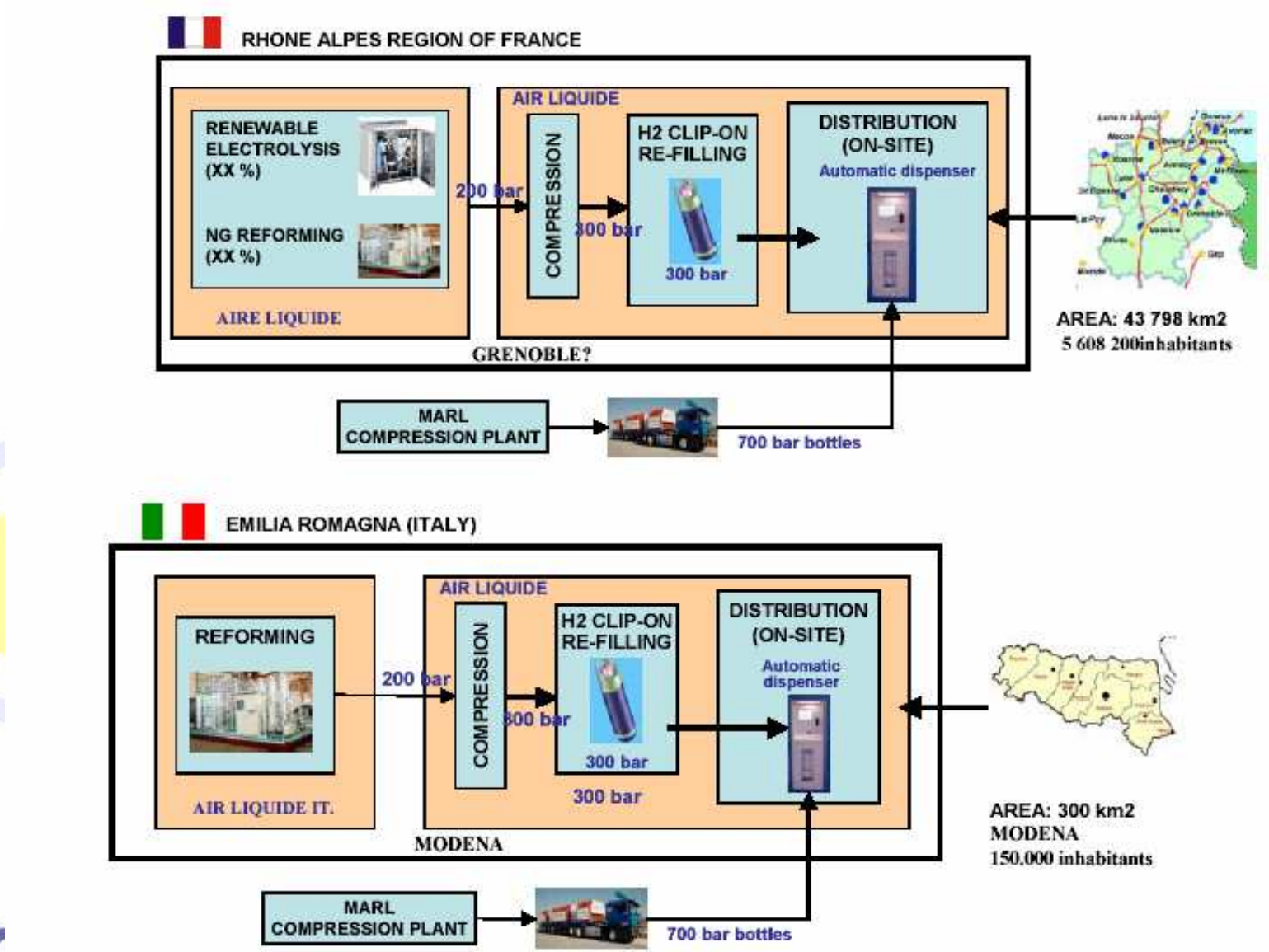
HYCHAIN: Hydrogen logistics



700 bar logistics



HYCHAIN: Distribution



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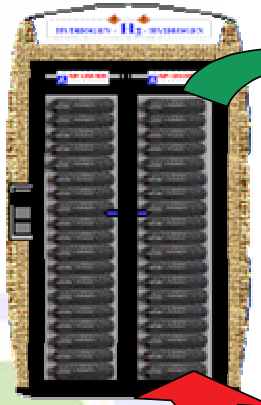
Innovative Hydrogen Distribution

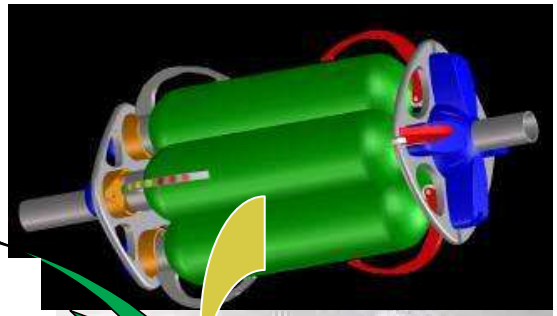
2 different types of bottles:
- 2 litres @ 700 bars
- 20 litres @ 300 bars



FULL

EMPTY

Clip'on receiving system



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User Friendly storage system

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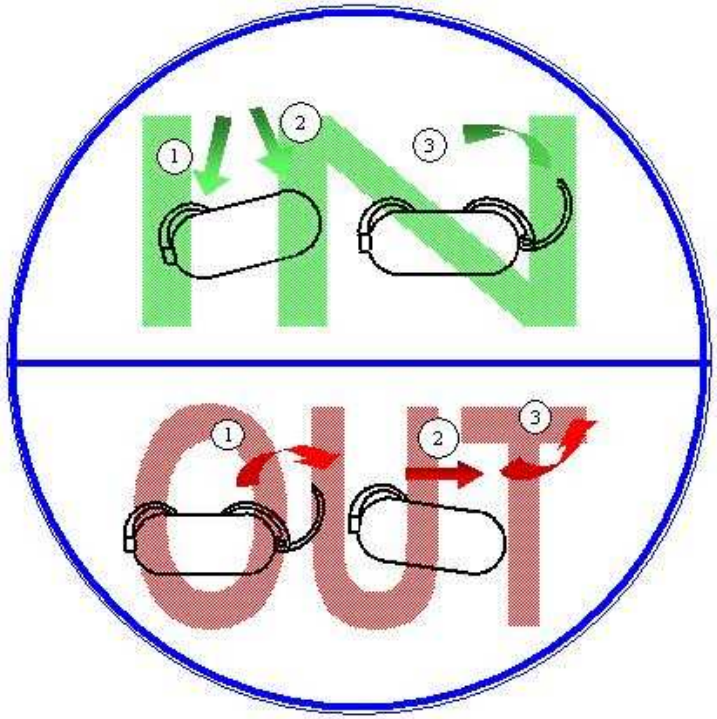
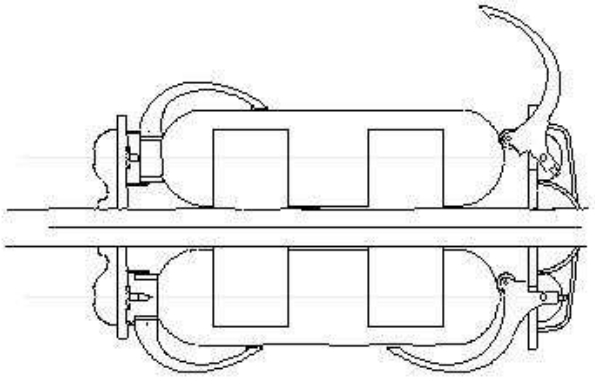
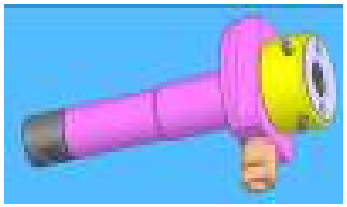
The clip-on concept

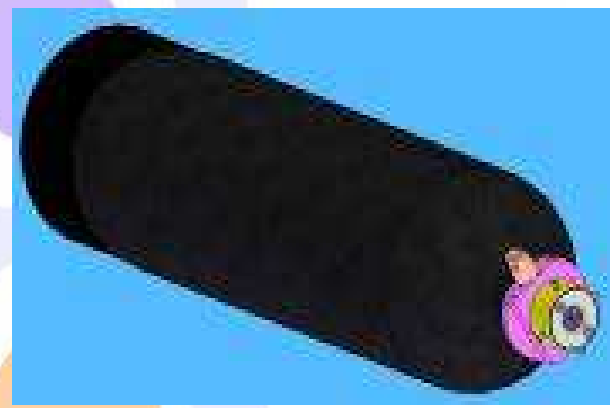




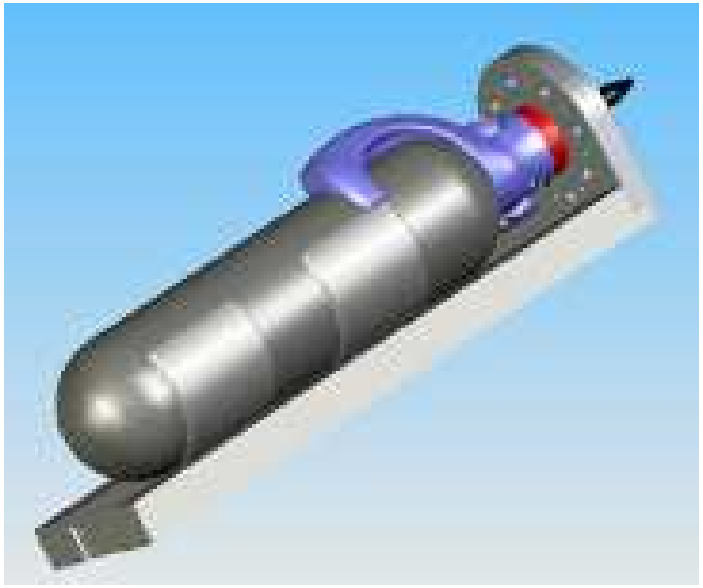
The clip-on technology



Integrated pressure relieve device + quick connect + safety devices (PRD)



+ lightweight cylinder
2 liters @ 700 bars / 20 liters @ 300 bar



+ ergonomic

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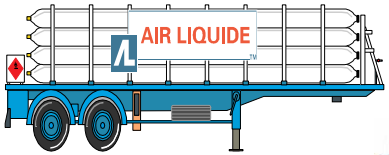
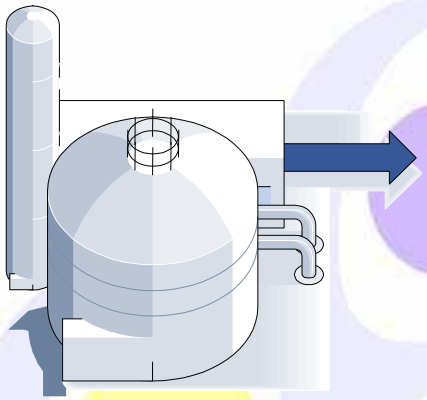
Cylinder or filling station for H2 delivery ?

Use of existing H2 filling center

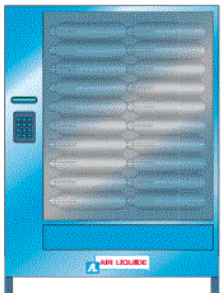
Upgrade to 300 and 700 bars



Fuelling station



Truck delivery



Vending machine or deposit

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Conclusions

- In the first phase of hydrogen energy deployment, the lack of refuelling stations and the public acceptance of the new fuel represent two of the major obstacles to the development in the future public domain.
- User-friendly solutions that can address challenges in terms of autonomy, safety, simplicity, quickness and availability issues
- Quick deployment and cost effective to address cross cutting issues
  - Public acceptance
  - Certification and homologation
- Captive fleets to allow demonstration and testing of the technology in a controlled environment
- Continuous monitoring and assessment to obtain operational feedback to improve technology and lower entry hurdles