NextHyLights

Supporting Action to Prepare Large-Scale Hydrogen Vehicle Demonstration in Europe

NEXTHYLIGHTS

WP6 Task 2: Environmental Impacts

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Meeting Daimler - Nabern
13-14 April 2010

NEXTHYLIGHTS

- Context of WP6

- WP6 - Task 6.2.Environmental impact
  - WtW analysis
  - Suggested actions
    - Hydrogen production
    - Transport
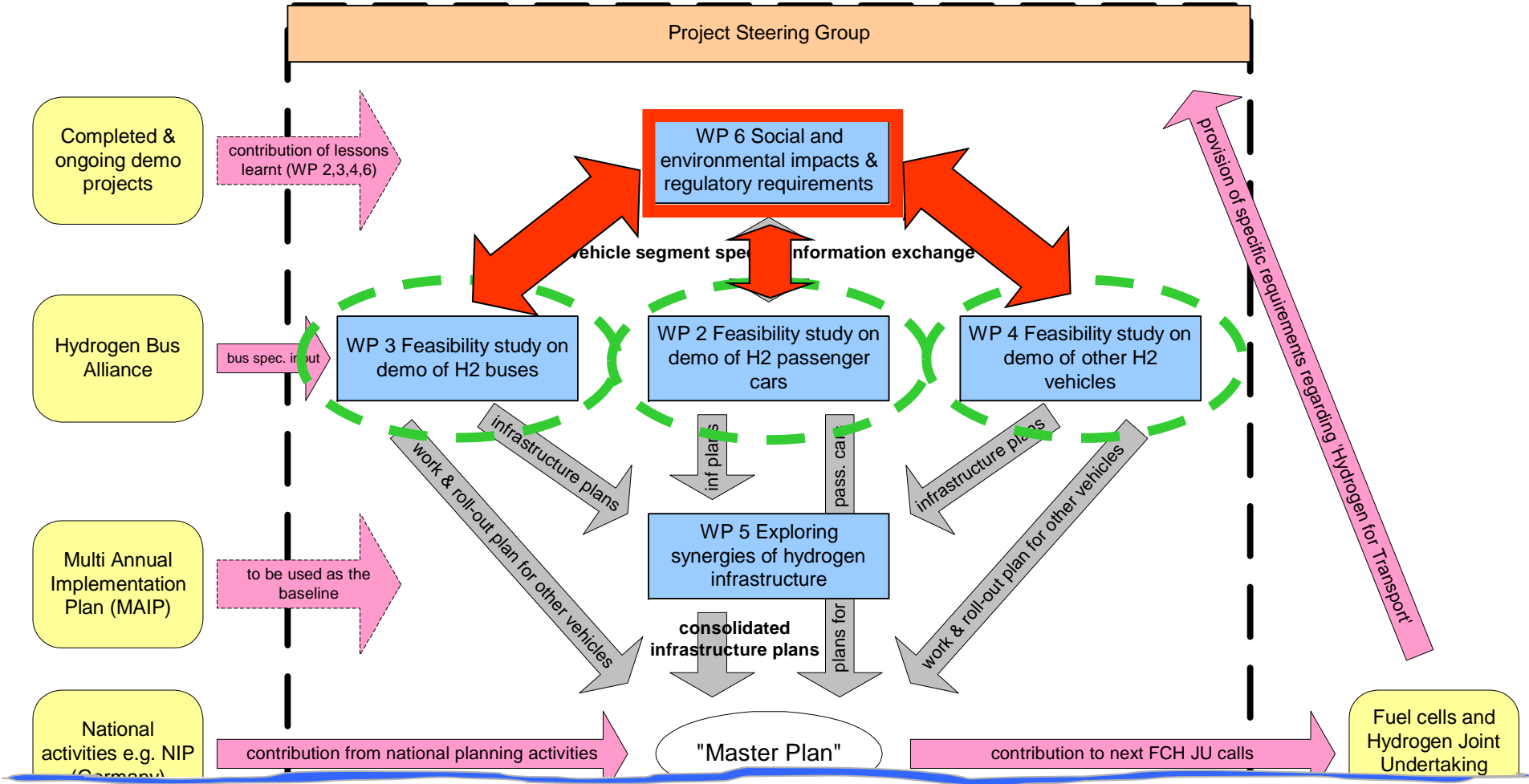   - Consumption

- Questions

NEXTHYLIGHTS

Deployment of hydrogen vehicles!

Social Acceptance

Feasibility of larger deployment,

assessment of emission reduction and

FCV market penetration scenarios

Demonstration projects

Project Steering Group

Completed & ongoing demo projects

contribution of lessons learnt (WP 2,3,4,6)

WP 6 Social and environmental impacts & regulatory requirements

vehicle segment specific information exchange

Hydrogen Bus Alliance

bus spec. input

WP 3 Feasibility study on demo of H2 buses

WP 2 Feasibility study on demo of H2 passenger cars

WP 4 Feasibility study on demo of other H2 vehicles

provision of specific requirements regarding 'Hydrogen for Transport'

infrastructure plans

work & roll-out plan for other vehicles

inf. plans

pass. cars

infrastructure plans

Multi Annual Implementation Plan (MAIP)

to be used as the baseline

WP 5 Exploring synergies of hydrogen infrastructure

work & roll-out plan for other vehicles

consolidated infrastructure plans

plans for

National activities e.g. NIP (Germany)

contribution from national planning activities

"Master Plan"

contribution to next FCH JU calls

Fuel cells and Hydrogen Joint Undertaking

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Objectives:

– Assess environmental impact of introduction Hydrogen Fuel Cell vehicles for:

- demonstrations facilities
- extrapolate to commercialisation phase

– Scope:

- Focus on Well-to-Wheel (WtW) GHG emissions
- Vehicles: Passenger cars, buses and special vehicles

– Approach:

- WtW analysis fed with data from partners
- Sensitivity analysis on important assumptions

– No Life Cycle Analysis!!

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**Well to Wheel
(WTW)** **=** **Well to Tank
(WTT)** **+** **Tank to Wheel
(TTW)**

Production   Transport   Dispensing   Use: ICE (fossil fuel)
or HFCV

FROM PARTNERS:

Market penetration rates HFCV

      Per country

      Per city

Hydrogen production pathways expressed in share. (e.g. 90% SMR, 10% Elec., 2015…)

On-site production share (% of total hydrogen production)

Emissions Model

Emissions per country 2010-2050

Per country emission reductions

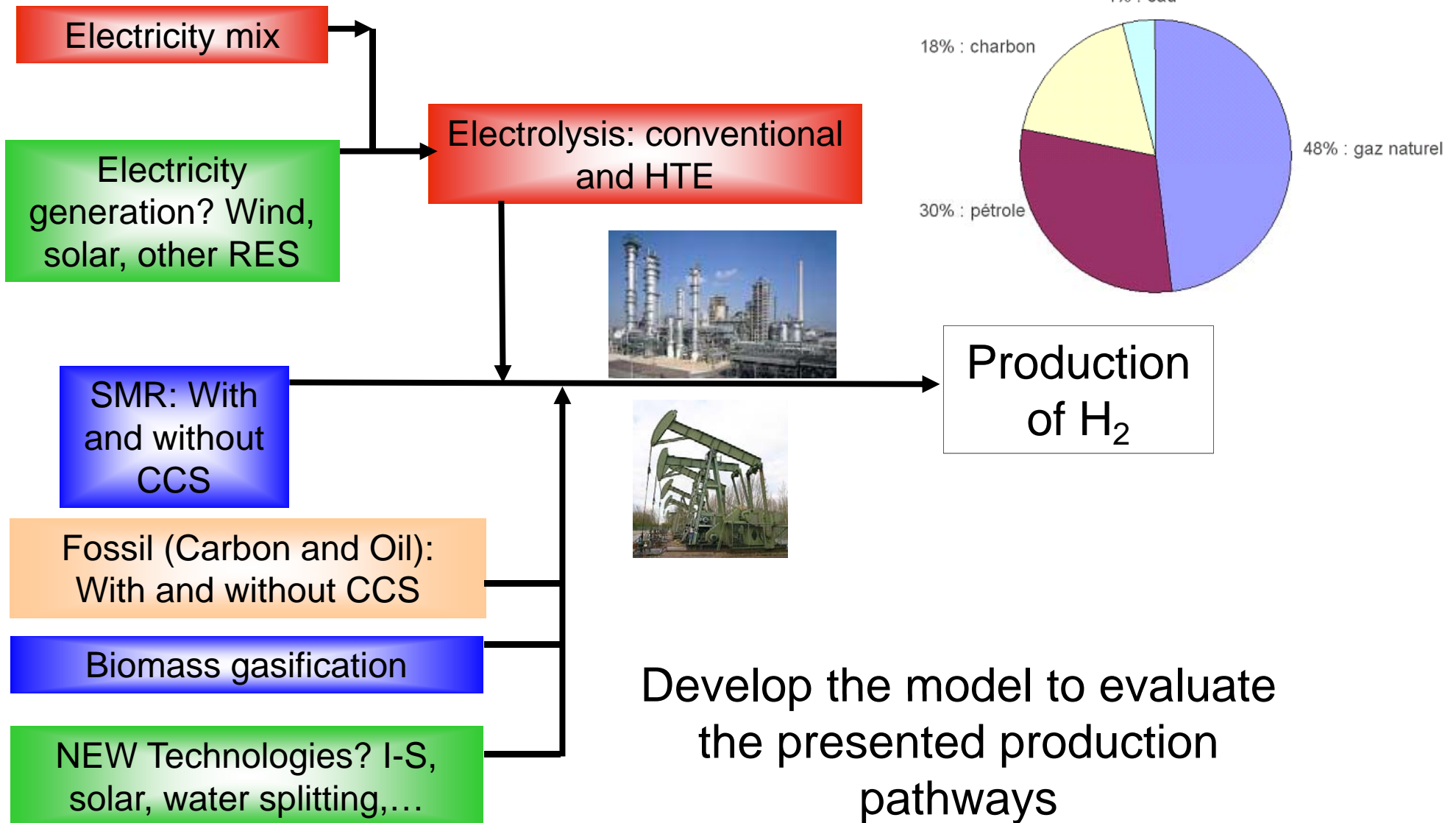Per city emission reductions

Comparison with BaU emissions

Sensitivity studies

Noise reduction (?)

DATABASES:

CONCAWE, EUROSTAT, LCA documents

Assess environmental impact… (1 - Production)

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Electricity mix

Electricity generation? Wind, solar, other RES

Electrolysis: conventional and HTE

SMR: With and without CCS

Fossil (Carbon and Oil): With and without CCS

Biomass gasification

NEW Technologies? I-S, solar, water splitting,…

Production of H_2

4% : eau
18% : charbon
48% : gaz naturel
30% : pétrole

Develop the model to evaluate the presented production pathways

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Production model based on:

• Share of every production process for hydrogen production

• Account the electricity mix of EU-27 countries (electrolysis
  pathway)

• Able to assume dedicated energy resources: Hydrogen
produced only by wind, or solar, etc.

•Include new processes that will produce hydrogen in a more
efficient way: HTE, Iodine-Sulfur, biomass

- Liquified hydrogen

H$_2$ pipelines (Gas)

- Estimate emissions of hydrogen transport
- Demonstration phase: trucking and on-site production
- Full deployment phase: trucking, on-site production and pipelines
       (Infrastructure depends on geographical situations)

- Account on-site hydrogen production emissions

- Compare emissions with traditional dispensing of fuel

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- Emissions:
- Vehicles, buses and special cars

- Vehicles: Compare with fossil fuel cars

- Buses: Compare with fossil fuel buses

- Special cars:
    - Create a baseline BaU assuming fossil fuel emissions (?)
    - Evaluate efficiency improvement of these vehicles (emissions ?)
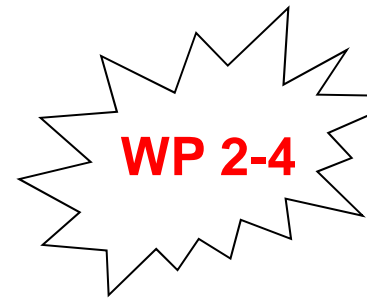   - Evaluate the reduction of emissions with market penetration rates

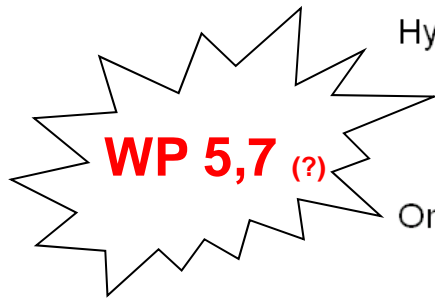**Well to Wheel (WTW)** = **Well to Tank (WTT)** + **Tank to Wheel (TTW)**

WP 2-4

FROM PARTNERS:

Market penetration rates HFCV
 Per country
 Per city

WP 5,7 (?)

Hydrogen production pathways expressed in share. (e.g. 90% SMR, 10% Elec., 2015...)

On-site production share (% of total hydrogen production)

Emissions Model

Emissions per country 2010-2050

Per country emission reductions
Per city emission reductions

Comparison with BaU emissions
Sensitivity studies

Noise reduction (?)

DATABASES:

CONCAWE, EUROSTAT, LCA documents

Study/scenario is to be used as a starting point: CONCAWE/EUCAR/JRC

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Air quality and health benefits Hydrogen Vehicles

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- Air quality impact HFCVs depend on the vehicles replaced.

- Health impact current ICE cars controlled by soot and NOx emissions: respiratory and cardiovascular diseases; increased morbidity and mortality.

- Stricter EU emission limits make new ICE cars increasingly cleaner.

- Nevertheless, up to about 2030, HFCVs will improve air quality and health. Especially in cities, were car emissions have larger health impacts because of dense population and limited dilution of exaust gases.

- ECN TEMPO model could be applied to project future emissions of curent car fleets and the air quality benefits of more HFCVs

Overview

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Questions

- Things to discuss:
  - WtW
    - Sensitivity studies:
      - When LCA values for CO_2 emissions are considered
      - CCS breakthrough
      - Size of the car, bus and special vehicle?
    - Are we going to include NOx?
    - What about noise reduction? (model with dB from current fleet)
    - Expected input coming from WP 2-4…August?
  - EU - level
  - Time frame – 2050?
  - How to build the BaU CO_2 emission scenario? (Hyways?)