Electromobility+

SEVENTH FRAMEWORK PROGRAMME

SCelecTRA

Scenarios for the Electrification of Transports

Electromobility+ - Mid-Term Event - February 6th 2014

Simon Vinot – IFP Energies nouvelles

IFP Energies nouvelles

© 2010 - IFP Energies nouvelles

Objective & Partners

- Duration : 3 years / started July 2012
- Key dimensions
  - Socio-économic issues
- SCelecTRA aims at :
  - identifying the long-lasting conditions & public policies for the development of electric mobility in Europe for 2025-2030, #social&policies
  - by testing them in detailed and realistic scenarios in an energy sector modeling tool combining technical and economical data #economics
  - and analyzing the real environmental impacts of such scenarios via Life Cycle Analysis. #enviromentalimpacts
- Partners involved

© 2010 - IFP Energies nouvelles

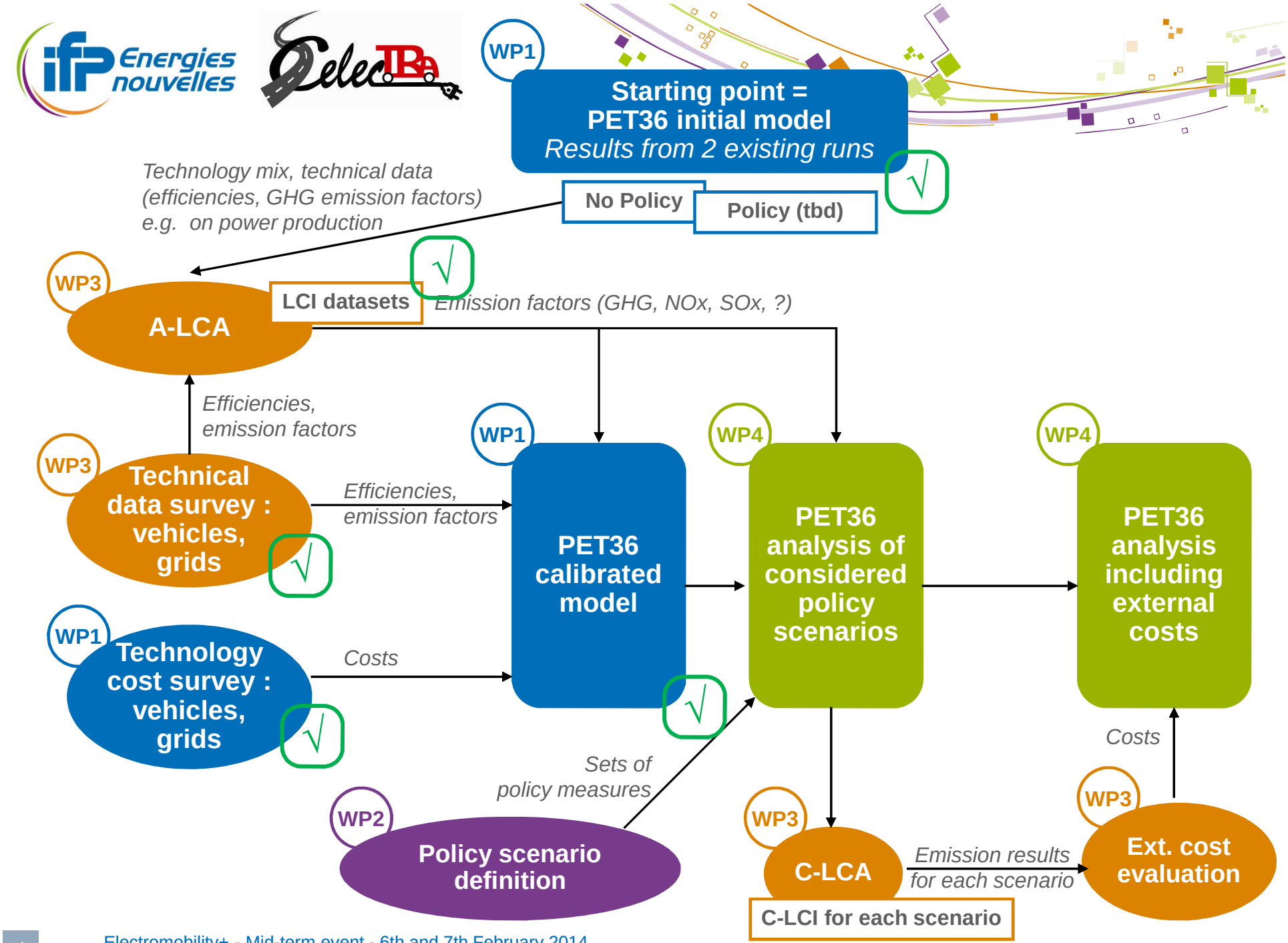
WP1: Transport sector model specifications and overall architecture

From an existing modeling tool of European Energy system (Pan European Times model PET36), the objective is to :

- define data requirements for model implementation
- specify the outputs of WP2 and WP3 towards the integration in WP4
- describe interactions with other energetic sectors
- implement new technical parameters to get a better description of the European transport sector
- lead the work on different ways to test public policy actions
- implement simple "smart grids" capabilities into the PET model

- Deliverables :
  - A guideline report for WP2&3 outputs
  - A calibrated model tool
- Partners: KANLO, IFPEN, IFSTTAR, PE CEE, EIFER

© 2010 - IFP Energies nouvelles


WP1
Starting point =
PET36 initial model
Results from 2 existing runs
Technology mix, technical data
(efficiencies, GHG emission factors)
e.g. on power production
No Policy
Policy (tbd)
WP3
A-LCA
LCI datasets
Emission factors (GHG, NOx, SOx, ?)
Efficiencies,
emission factors
WP3
Technical data survey : vehicles, grids
Efficiencies,
emission factors
WP1
PET36 calibrated model
WP4
PET36 analysis of considered policy scenarios
WP4
PET36 analysis including external costs
WP1
Technology cost survey : vehicles, grids
Costs
Sets of
policy measures
WP2
Policy scenario definition
WP3
C-LCA
C-LCI for each scenario
Emission results
for each scenario
WP3
Ext. cost evaluation
Costs

WP2: Environmental policy benchmarking

- The objective is to :
  - investigate what kind of existing environmental regulations and fiscal legislations may facilitate business / household consumer adoption of low carbon vehicles in European countries.
  - define different prospective scenarios of policy measures aiming at inciting passengers to adopt low-carbon vehicles.
- ...and to provide inputs for the scenarios (WP4).
- Deliverables:
  - An “Econometric analysis report” will analyse and quantify the sensibility of fleet structures to environmental policies in various countries.
  - A "Policy scenario definition report" will define the scenarios to be used in SCelecTRA.
- Main partners: IFSTTAR, IFPEN.

© 2010 - IFP Energies nouvelles

Policy Instruments: Dummy variables

Population

Total population
% of rural population
% or urban population
Population density

Road network

Total road network
% of motorways

Economics

GDP
GDP per capita

Dwelings

Total construction dwellings

Automotive market

Car /1000 inhabitants
Stock of cars
Stock of gasoline cars & %
Stock of diesel cars & %
Stock of LPG cars & %
Stock of CNG cars & %
Stock of electric cars & %
Registration of new cars
Registration of new gasoline cars
Registration of new diesel cars
Registration of new LPG cars
Registration of new electric cars

Policies

Fuel tax
Scrappage
Feebate
Circulation tax
Acquisition tax
CO2 tax

Fuels and fuel markets

Average gasoline consumption
Average diesel consumption
Gasoline price
Diesel price
LPG price
Price difference between gasoline and diesel

Mobility

Yearly mileage by cars
Yearly mileage by gasoline cars
Yearly mileage by diesel cars

© 2010 - IFP Energies nouvelles

WP3: Environmental assessment: Life Cycle Assessment and quantification of external costs

- LCA of PHEV and EV pathways following 2 approaches
  - Classical (attributional) LCA: boundaries restricted to WTW steps
  - Broader environmental assessments -> consequential LCAs (specially relevant for prospective analysis / impacts associated to a policy decision)
- ... to compare corresponding results in order to provide
  - analysis on relevance of each methodology for answering specific questions;
  - recommendations for the possible standardization of GHG emissions and energy consumption assessments of EV and PHEV.
- On-going activities

a. prediction of future changes in emission intensities for raw material used in component manufacture, with an adjustment into the GaBi models for each material, considering as well the variation in the energy profiles involved in the production of each material in 2030 Estimation of electricity mix for 2030 in Europe ;

b. LCA modelling in GaBi 6 for each car technology including assembly, use phase and EoL (recycling options for materials) ;

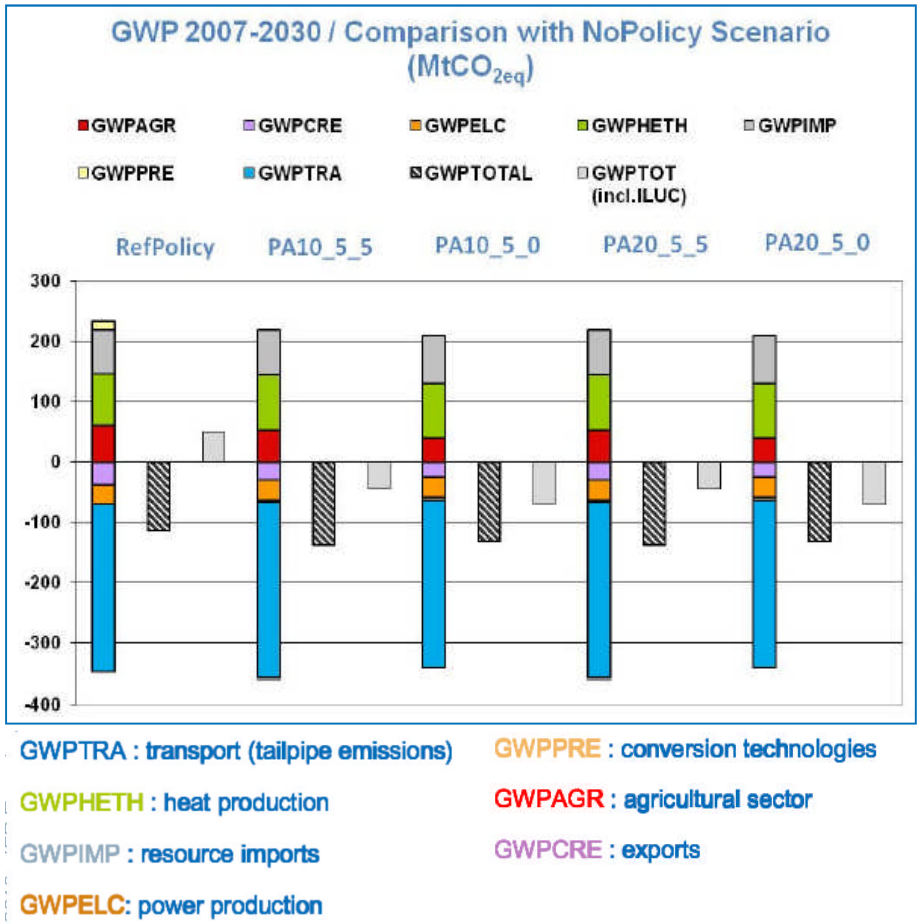
Results for different impact categories will be analysed and presented when modellling is finalized.

- Partners: IFPEN, PE CEE, EIFER

© 2010 - IFP Energies nouvelles

WP3 / Task 3.2 - Consequential LCA

What kind of results do we expect ?



- Quantification of the CO2 , GHG emissions and energy balances, etc. for various public policies implementation scenarios with the same mobility demand
- Example of such an C-LCA approach : GWP associated to several possible policy scenarios for France over 2007-2030 period (renewable energy & biofuels targets etc.)
- GWP result = GWP of the considered policy scenario – GWP of “No Policy” scenario
- First level of results : contribution of each “sector” (agriculture, power prod, biofuel production / conversion, transport etc.) in the GWP change compared to “No Policy” scenario.

Source : F. Bouvart, S. Tchung-Ming, Assessing scenarios in consequential LCA using a long-term energy model: application to GHG emissions in the French energy sector, SETAC North America, Long Beach, Nov. 2012.

WP 4: Scenarios for the Electrification of Transport: Policy analysis

- The objective is to
  - integrate the outputs of WP2 and WP3 into a consistent set of parameters describing technologies, legislations and environmental impacts
    - optimize the vehicle technologies penetration regarding mobility demand and energetic resource availabilities
    - test the efficiency of incentive measures on EV, PHV and FEV market penetration
    - analyze the effects on electricity demand and the need in transmission technologies and on the overall European energy sector
    - compare environmental impacts of contrasted mobility scenarios
- Deliverables:
  - Operational modeling tool
  - Transport policy, environmental and cost benefit analysis report
- Partners: IFPEN, KANLO, PE CEE, IFSTTAR, EIFER

© 2010 - IFP Energies nouvelles

What will you read from SCelecTRA in the next months?

Del. N°.	Deliverable name	Delivery date
D3.1	Attributional LCA report – *LCA results of vehicles for 2010 and 2030*	April 2014
D2.1	Econometric analysis report – *an analysis of the past public policies to support the development of new automotive markets*	April 2014
D2.2	Policy scenario definition report – *Future electromobility public policies for Europe until 2030*	June 2014

http://projet.ifpen.fr/Projet/jcms/xnt_79165/scelectra

© 2010 - IFP Energies nouvelles

Appendix

© 2010 - IFP Energies nouvelles

Reference scenario – E01 from the EMF28 project

- **Energy Modeling Forum: EMF28 (**The Effects of Technology Choices on EU Climate Policy)

- *E01 scenario:* including the 2020 targets and 40% GHG reduction by 2050 | CCS on | Nuclear energy ref | Energy efficiency ref | Renewable energies ref.

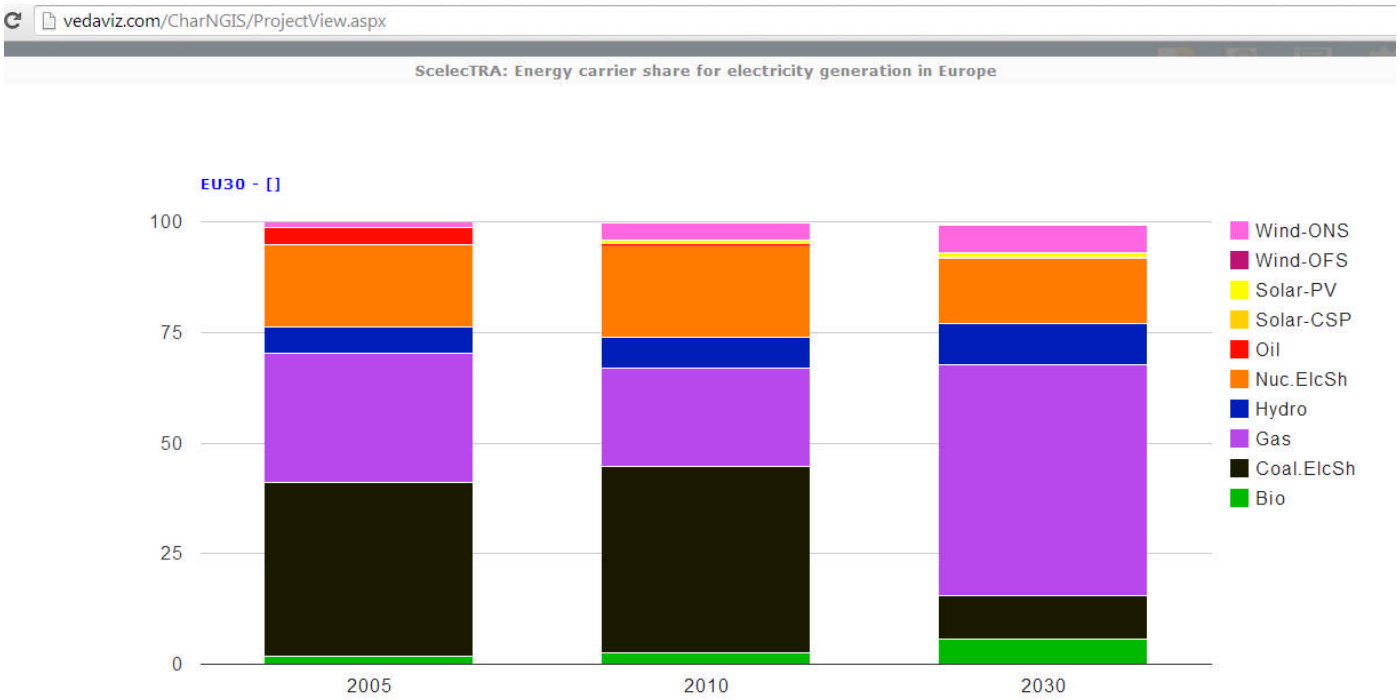
- Scenario modeled by PET model and chosen as a reference energy system for the A-LCA work in 2030 concerning:
  - The primary fuel balance (oil, gas, coal, biomass)
  - The average electric mix
  - The liquid fuel composition consumed by each vehicle technology

© 2010 - IFP Energies nouvelles

Reference scenario – E01 from the EMF28 project

- *Example of EMF28 – E01 scenario outputs*

Energy carrier share for electricity generation in Europe



© 2010 - IFP Energies nouvelles