Electromobility+

SEVENTH FRAMEWORK PROGRAMME

INSTITUT FÜR HÖHERE STUDIEN
INSTITUTE FOR ADVANCED STUDIES
Eco & Fin APPLIED RESEARCH Vienna

DEFINE

Evaluating Costs and Benefits of E-mobility

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Structure of Presentation

Project Goal
Project Results
    Steps Ahead
Contribution to Key Dimensions
Future Prospects and Opportunities of DEFINE

DEFINE Consortium - Partners

1. Institute for Advanced Studies (IHS), Vienna (Coordinator)
2. Center for Social and Economic Research (CASE), Warsaw
3. German Institute for Economic Research (DIW), Berlin
4. Institute for Applied Ecology (OEI), Berlin
5. Vienna University of Technology (TUW), Vienna
6. Environment Agency Austria (EEA), Vienna

Project Goal: Evaluation Framework

Analysing an anticipated **change in the mobility paradigm**:

- From a fossil fuel-based individual transportation system
- to one relying on electromobility and public transport.

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- to one relying on electromobility and public transport.

Assessing the overall **economic costs/benefits** associated with a higher share **of E-mobility** for Austria, Germany and Poland taking account of

- Heterogenous household preferences,
- Details on vehicle technologies (CV, HEV, PHEV, EV)
- Additional electricity demand and impact on electricity grids,
- Environmental impacts and externalities (GHG emissions, etc.).

Evaluation Framework

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3. **Two electricity market models** quantify impact on electricity sector
4. Economic costs/benefits are quantified, policy scenarios are simulated in a hybrid **General Equilibrium (CGE) model**
5. Quantification of emission reduction potential and environmental benefits.

Results: Household Survey and Microestimation (WPs 3+8)

- **Household Survey** for Austria (spring 2013): representative for Austria, 1400 interviews, discrete choice experiments for car purchase and transport mode choice. *(finished)*
- Estimation of **2 multinomial logit models** focusing on vehicle purchase choice and transport mode choice, respectively. *(finished)*
- **Input into CGE model** in form of aggregated household data (micro-macro link) and estimated elasticities. *(finished)*
- **Coordination** between Austrian and Polish household survey (Polish currently in progress).

Results: Electricity Market Modelling (WPs 2+7)

Model extensions to include additional **PHEV, EV electricity demand** in energy system

- accounting for certain types of **load profiles** (WPs 3+4) *(finished)*
- controlled and uncontrolled charging options. *(finished)*

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Simulation results for Austria/Germany (TUW) and Germany (DIW):

- Electricity **dispatch** by technology incl. EV as storage option
- Additional electricity **demand** due to EV use
- Implied changes for **power plant complex** and electricity **price**

...inputs into CGE model.

Results: Scenario Building (WP4)

Dataset on **vehicle technology** and **vehicle stock** developments (CV, HEV, PHEV, EV) for Austria/Germany until 2030 *(finished)*

Dataset on additional **energy demand** for transport sector and additional **electricity demand** for xEVs up to 2030 *(finished)*

Results: Scenario Building (WP4)

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Scenario measures:

- feebates, CO2-taxation, mineral oil tax increase
- charging station expansion (additional investments), subsidy of battery costs
- changes in range, power, charging time, etc. (vehicle attributes and socio-demographic household characteristics)

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Results: Extentions of CGE Model (WPs 1+6)

More detailed transport sector: mode choice, *(finished)*
vehicle technologies: CVs, HEVs, PHEVs and EVs *(finished)*

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- Inclusion of Discrete Choice Model (WP3) within CGE model. *(finished)*
- Allows economic impact analysis of vehicle attributes and socio-demographic household characteristics

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Calibration to replicate results of more detailed external models:

- Vehicle stock projections from scenario building (WPs 3+4)
- Electricity market model results: dispatch, prices and merit order (WPs 2+7)

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Other model extensions: 9 households (skill level and degree of urbanization), extension of bottom-up electricity sector *(finished)*

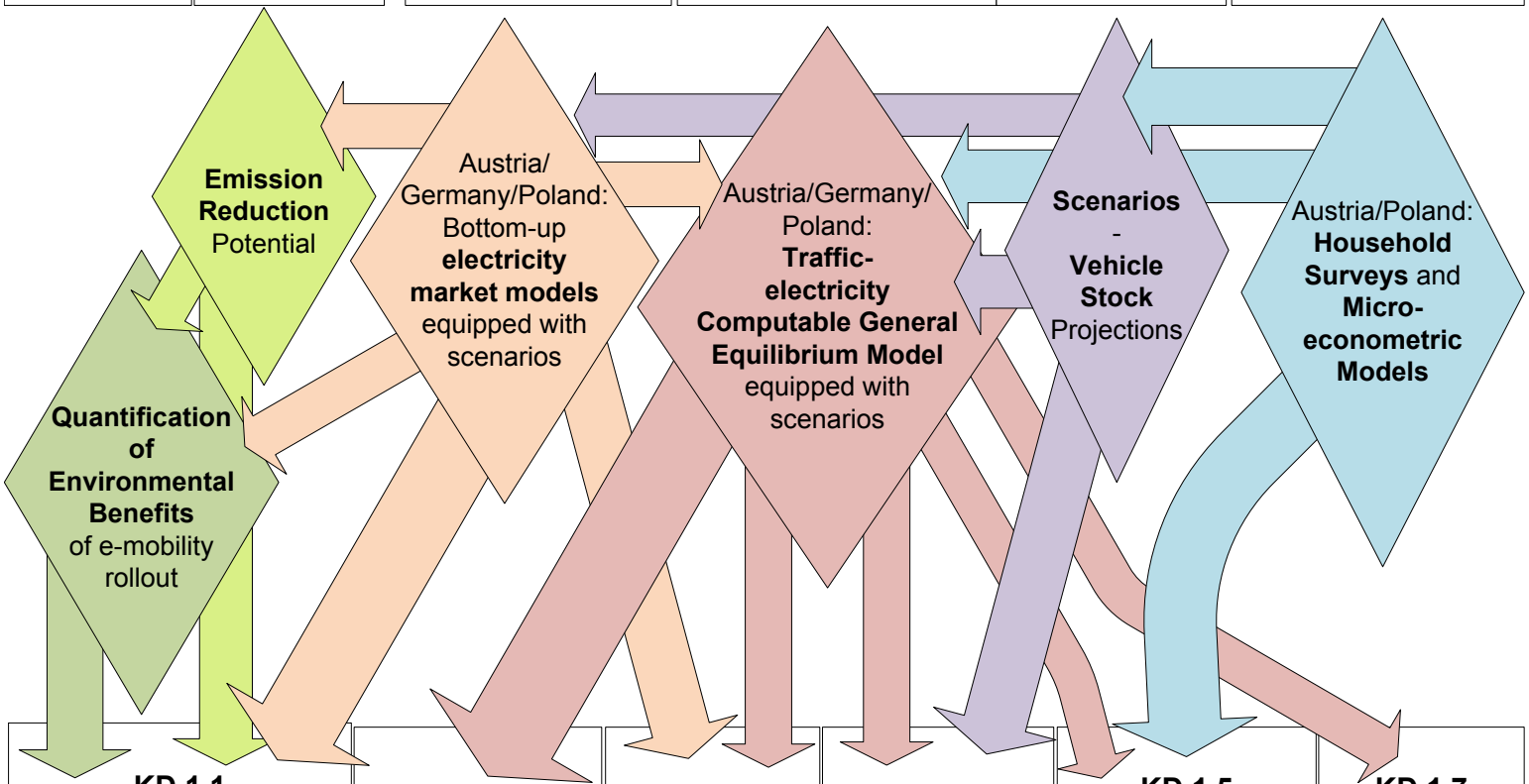
Steps Ahead for Project Workflow

Work steps for coming months:

- March 2014: **CGE model development** finished, models calibrated and scenarios implemented (WPs 1 & 6).
- March 2014: **Electricity market model development** finished, models calibrated and scenarios implemented (WPs 1 & 7).
- May 2014: **Emission Reduction Potential** of Electric Mobility for Austria and Germany; Inputs from electricity market modelling and scenario building (WP 5)
- May 2014: **Household survey for Poland** realized, input into CGE model (WP 8)
- September 2014: **Scenarios and case studies are completed** (all WPs) including quantification of environmental benefits (WP 9).

DEFINE - Contribution to Key Dimensions

CASE	OEI	UBA	DIW	TUW/ESEA	IHS	OEI	UBA	IHS	CASE
WP9	WP5		WPs 2 & 7		WPS 1 & 6	WP4		WPS 3 & 8	



KD 1.1
Analysis of impact of EM in relation to energy production, consumption and saving (power suppliers)

KD 1.2
Economic and tax legislation models for EM

KD 1.3
European energy production profiles

KD 1.4
Energy and EM penetration scenarios up to 2025

KD 1.5
Use and user patterns, social acceptability of Electromobility (EM)

KD 1.7
Synergies and effects on the current transport system

Key Dimensions Addressed

Results:

Evaluation framework for the introduction of electro-mobility
–
Model simulation results for **Austria, Germany and Poland**
–
Assessment of **total economic costs** of the anticipated shift to E-mobility
–
Guidelines for policy makers
–
Reports and research papers

Future Prospects and Opportunities of DEFINE

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Viability of DEFINE research beyond the project:

- **Extension** of modelling framework **to other European countries** possible
- Policy guidelines can serve as **blueprint for policy design**

Thank you for your attention!

Project Homepage: `http://www.ihs.ac.at/projects/define`

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