EViews – IHS 1st User Meeting

Global Commodity Markets - Scenarios, Prices and Forecasts - Focus on Energy

Quantifying macroeconomic, ecologic and energetic effects: Simulation model of the (Upper) Austrian economy with main emphasis on energy - MOVE

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Frankfurt, 22nd October 2014

Energy Institute: Focus on working fields

- Last three years: participation in **approximately 90 projects**
  - own research
  - contract research
  - public funded research
- Strength: **multidisciplinary knowledge** of more than one scientific field in energy research (economics, law, technics, sociology)
- combination of these three core disciplines allows **comprehensive analyses** and accounts for all aspects of future-oriented energy topics
- Special focus an **macro-perspective**: integration of macroeconomic effects/welfare effects of certain technologies, actions, services, productions, systems,…
- **Macro-econometric modeling (of energy markets)**
- Comparative **technology evaluation** with **Life Cycle Assessment** and Product Sustainability Assessment methodologies

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Energy Institute: Focus on working fields

- Combination of the core disciplines (economics, law, technics, sociology) allows **comprehensive analyses** and accounts for all aspects of future-oriented energy topics

Recent projects

- Energy Economics

- Macroeconometric modelling of the energy sector
- Strategies for energy efficiency improvements
- Smart Metering and consumer motivation
- CO_2 abatement costs, GHG targets 2030 and emission trading systems
- Fuel poverty

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Macroeconometric analyses

- Quantitative macroeconomic analyses: Evaluation of the effects of the action / shocks on classical economic indicators (GDP, employees, private consumption, investment, etc.).
- The analyses covers not only primary effects but also dynamic and second- and third-round effects.

- Team:
  - Martin Baresch, *Economist & Statistician, Researcher*
  - Sebastian Goers, *Economist, Senior Researcher*
  - Friedrich Schneider, *Economist, Head of the Department of Energy Economics & Professor at the Institute of Economics at the Johannes Kepler University of Linz*
  - Robert Tichler, *Economist, Deputy Executive Director of the Energy Institute*

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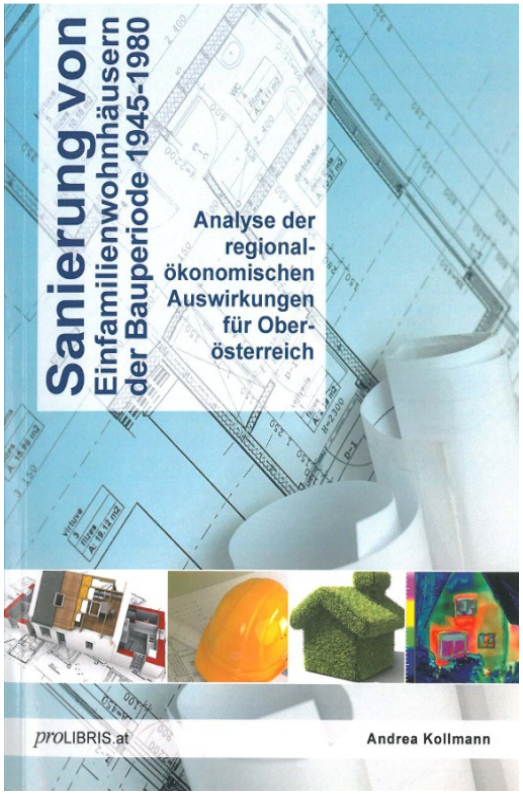
Macroeconometric analyses

- Development of the model MOVE (2004 to 2009)



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MOVE - Overview

- **Quantifying macroeconomic, ecologic and energetic effects:** Simulation model of the (Upper) Austrian economy with main emphasis on energy – **MOVE**
- The main emphasis lies on energy which enables comprehensive and complex studies of all aspects of the (local) energy market.
- The model was principally designed for **Upper Austria**, but is suitable for the entire Austrian area accounting for special structural characteristics.
- MOVE was already applied in several regional and national projects (financed e.g. by the Austrian Climate and Energy Fund, regional institutions and energy providers) particularly for the economic analysis of energy and environment related

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MOVE - Overview

Basic Procedure of MOVE

- Integration of all regressions and all identities in an overall model
- Solution of the overall model by **EViews** (Gauss-Seidel algorithm)
- Illustration of a business-as-usual scenario; results of simulations by MOVE are to be regarded as a **departure from the business-as-usual scenario**

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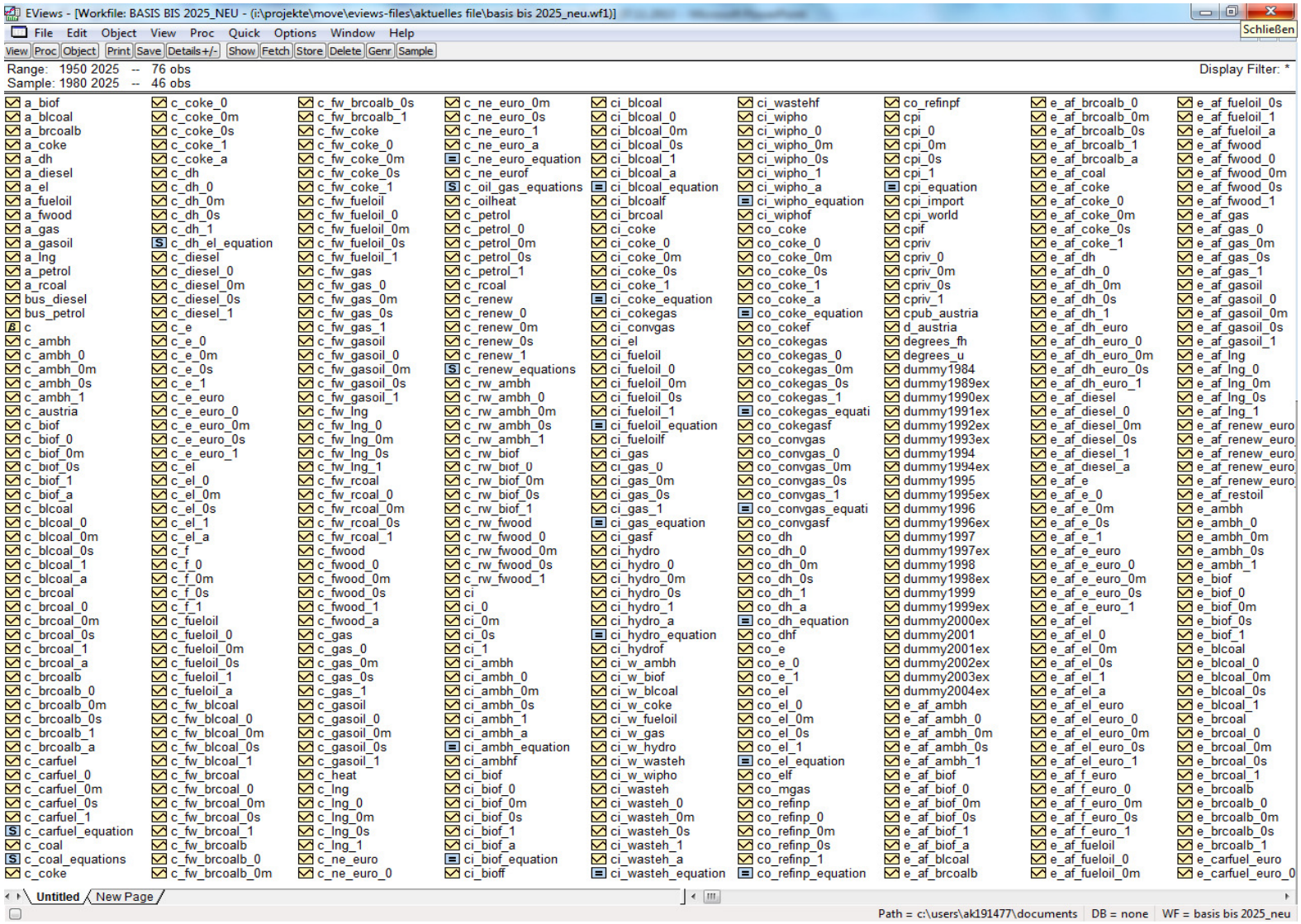
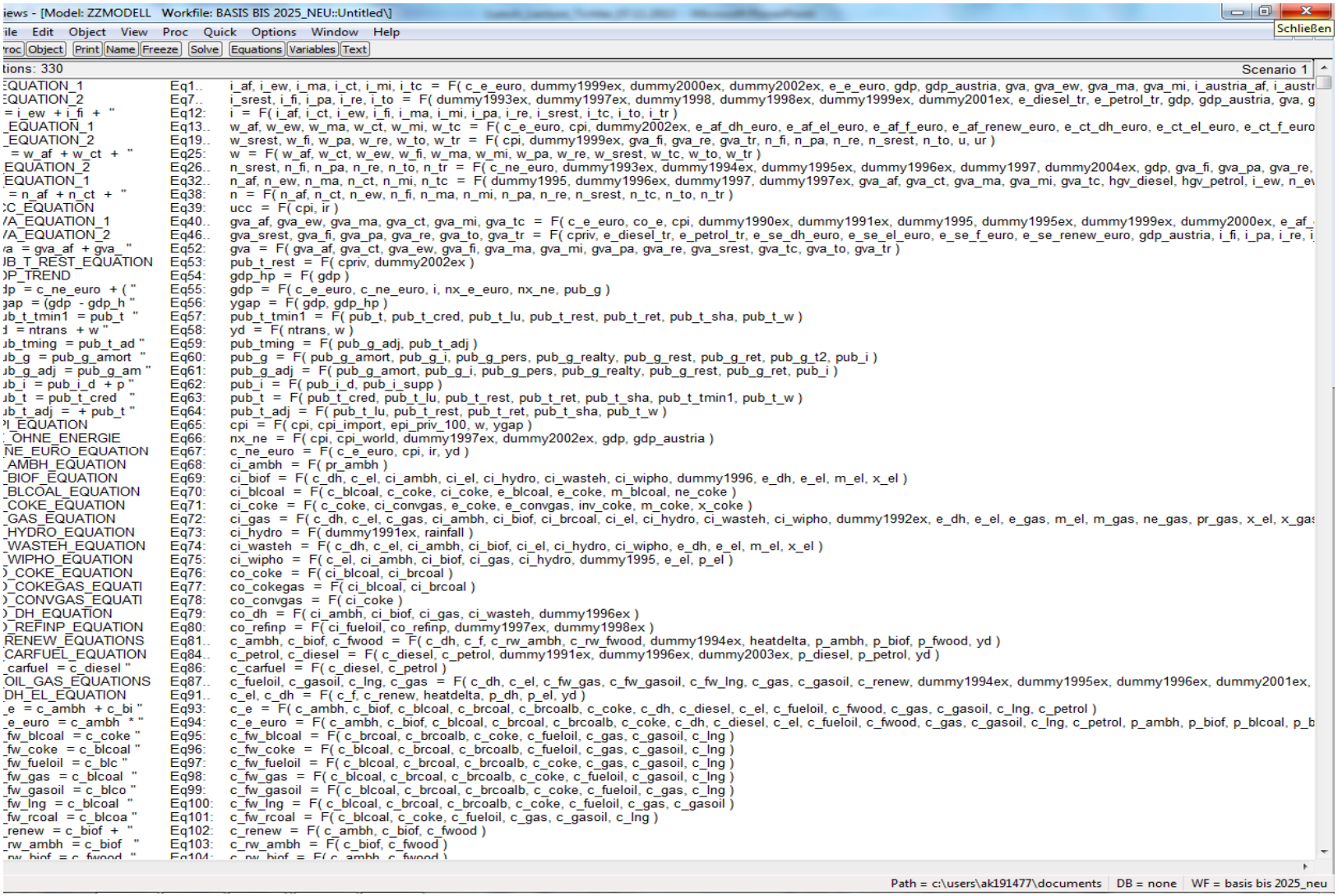
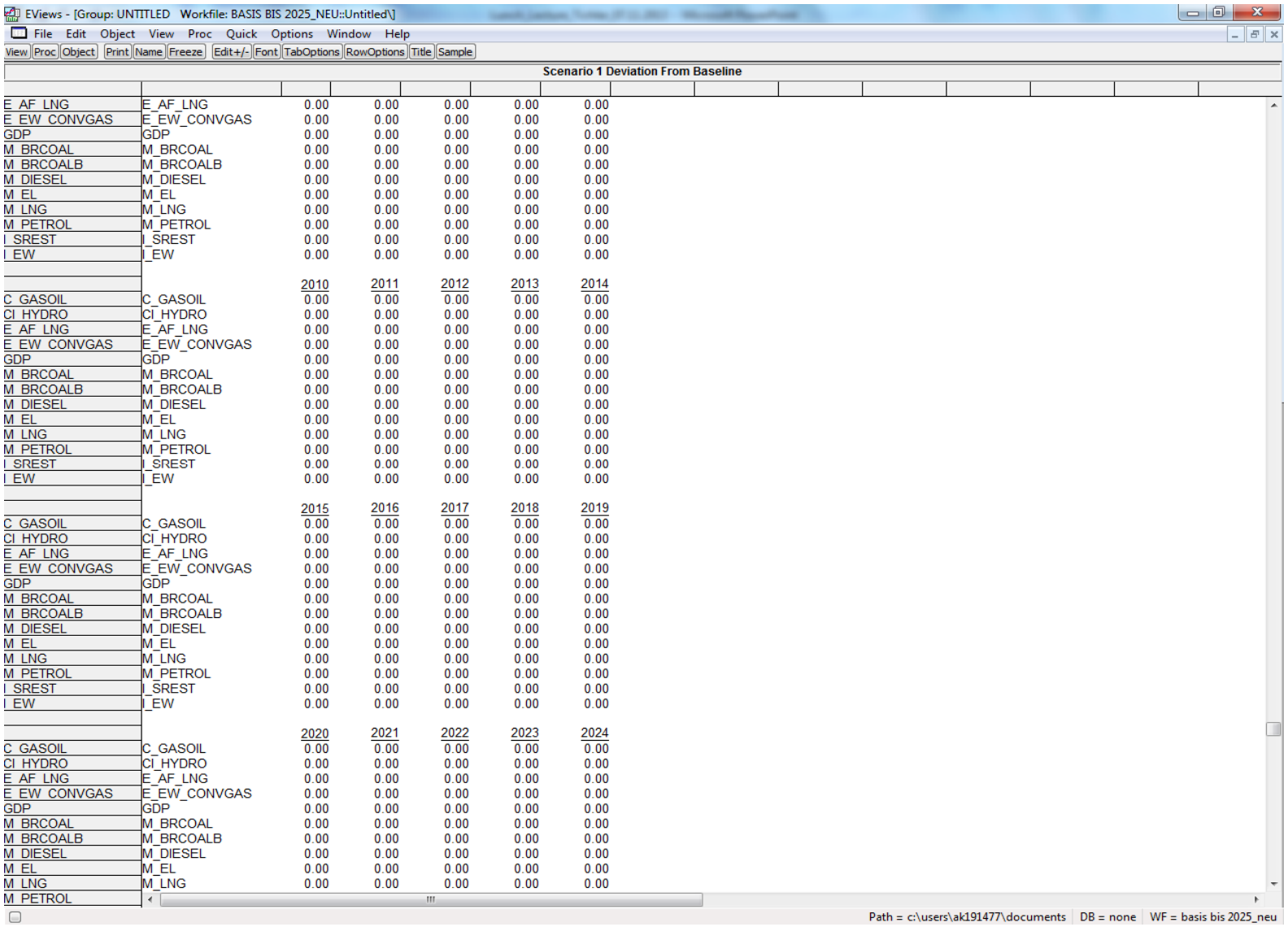
MOVE - Overview



MOVE - Overview



MOVE - Overview



EViews - [Group: UNTITLED Workfile: BASIS BIS 2025_NEU::Untitled\]

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Scenario 1 Deviation From Baseline

E_AF_LNG	E_AF_LNG	0.00	0.00	0.00	0.00	0.00
E_EW_CONVGAS	E_EW_CONVGAS	0.00	0.00	0.00	0.00	0.00
GDP	GDP	0.00	0.00	0.00	0.00	0.00
M_BRCOAL	M_BRCOAL	0.00	0.00	0.00	0.00	0.00
M_BRCOALB	M_BRCOALB	0.00	0.00	0.00	0.00	0.00
M_DIESEL	M_DIESEL	0.00	0.00	0.00	0.00	0.00
M_EL	M_EL	0.00	0.00	0.00	0.00	0.00
M_LNG	M_LNG	0.00	0.00	0.00	0.00	0.00
M_PETROL	M_PETROL	0.00	0.00	0.00	0.00	0.00
I_SREST	I_SREST	0.00	0.00	0.00	0.00	0.00
I_EW	I_EW	0.00	0.00	0.00	0.00	0.00
		2010	2011	2012	2013	2014
C_GASOIL	C_GASOIL	0.00	0.00	0.00	0.00	0.00
CI_HYDRO	CI_HYDRO	0.00	0.00	0.00	0.00	0.00
E_AF_LNG	E_AF_LNG	0.00	0.00	0.00	0.00	0.00
E_EW_CONVGAS	E_EW_CONVGAS	0.00	0.00	0.00	0.00	0.00
GDP	GDP	0.00	0.00	0.00	0.00	0.00
M_BRCOAL	M_BRCOAL	0.00	0.00	0.00	0.00	0.00
M_BRCOALB	M_BRCOALB	0.00	0.00	0.00	0.00	0.00
M_DIESEL	M_DIESEL	0.00	0.00	0.00	0.00	0.00
M_EL	M_EL	0.00	0.00	0.00	0.00	0.00
M_LNG	M_LNG	0.00	0.00	0.00	0.00	0.00
M_PETROL	M_PETROL	0.00	0.00	0.00	0.00	0.00
I_SREST	I_SREST	0.00	0.00	0.00	0.00	0.00
I_EW	I_EW	0.00	0.00	0.00	0.00	0.00
		2015	2016	2017	2018	2019
C_GASOIL	C_GASOIL	0.00	0.00	0.00	0.00	0.00
CI_HYDRO	CI_HYDRO	0.00	0.00	0.00	0.00	0.00
E_AF_LNG	E_AF_LNG	0.00	0.00	0.00	0.00	0.00
E_EW_CONVGAS	E_EW_CONVGAS	0.00	0.00	0.00	0.00	0.00
GDP	GDP	0.00	0.00	0.00	0.00	0.00
M_BRCOAL	M_BRCOAL	0.00	0.00	0.00	0.00	0.00
M_BRCOALB	M_BRCOALB	0.00	0.00	0.00	0.00	0.00
M_DIESEL	M_DIESEL	0.00	0.00	0.00	0.00	0.00
M_EL	M_EL	0.00	0.00	0.00	0.00	0.00
M_LNG	M_LNG	0.00	0.00	0.00	0.00	0.00
M_PETROL	M_PETROL	0.00	0.00	0.00	0.00	0.00
I_SREST	I_SREST	0.00	0.00	0.00	0.00	0.00
I_EW	I_EW	0.00	0.00	0.00	0.00	0.00
		2020	2021	2022	2023	2024
C_GASOIL	C_GASOIL	0.00	0.00	0.00	0.00	0.00
CI_HYDRO	CI_HYDRO	0.00	0.00	0.00	0.00	0.00
E_AF_LNG	E_AF_LNG	0.00	0.00	0.00	0.00	0.00
E_EW_CONVGAS	E_EW_CONVGAS	0.00	0.00	0.00	0.00	0.00
GDP	GDP	0.00	0.00	0.00	0.00	0.00
M_BRCOAL	M_BRCOAL	0.00	0.00	0.00	0.00	0.00
M_BRCOALB	M_BRCOALB	0.00	0.00	0.00	0.00	0.00
M_DIESEL	M_DIESEL	0.00	0.00	0.00	0.00	0.00
M_EL	M_EL	0.00	0.00	0.00	0.00	0.00
M_LNG	M_LNG	0.00	0.00	0.00	0.00	0.00
M_PETROL						

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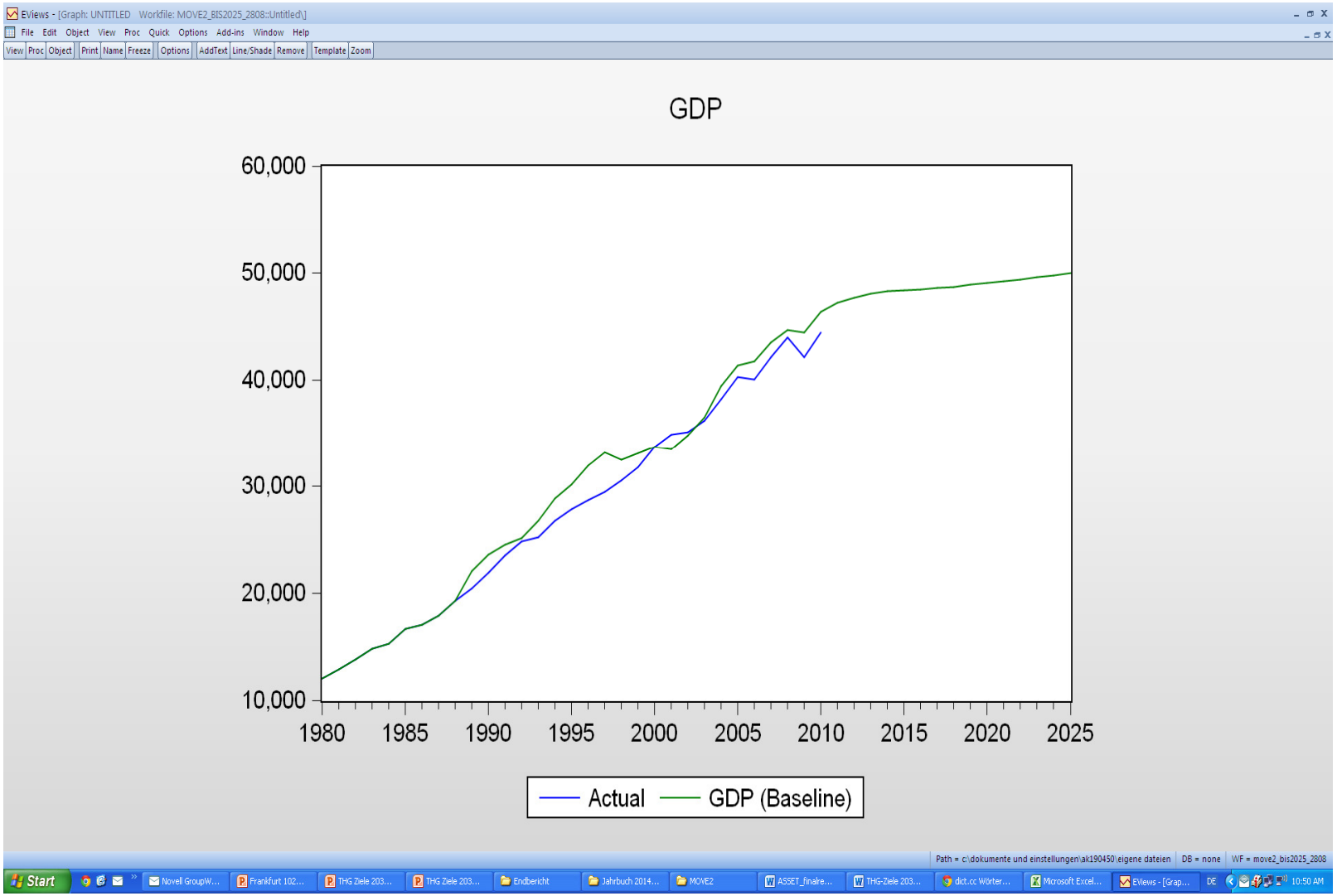
MOVE - Overview



MOVE - Overview

Characteristics of MOVE:

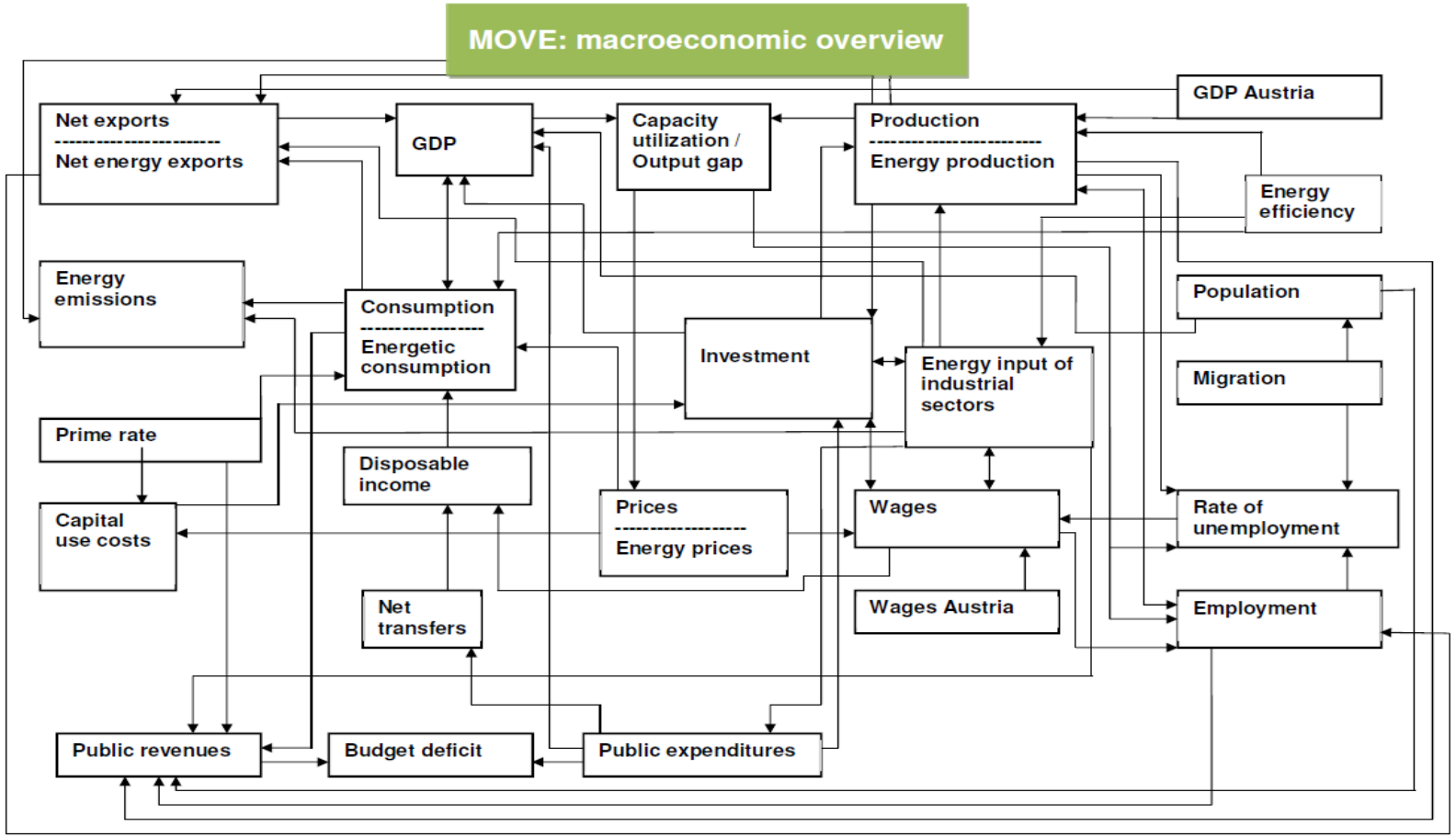
Number of equations:	~ 330
Number of variables	~ 542
Number of sectors (including private households)	13
Number of energy sources:	24
Preferred time frame for simulations	1-10 years

Covered energy sources:

ambient heat	combustible turf	fuel oil (heavy)	orher refinery inputs
biogenic fuel	crude oil	fuel oil (light)	petrol
brown coal	diesel	hydro power	solar and wind power
coal briquets	district heat	kerosene	stack gas
coke	electric power	liquefied gas	stone coal
coke oven gas	fire wood	natural gas	waste

MOVE - Overview

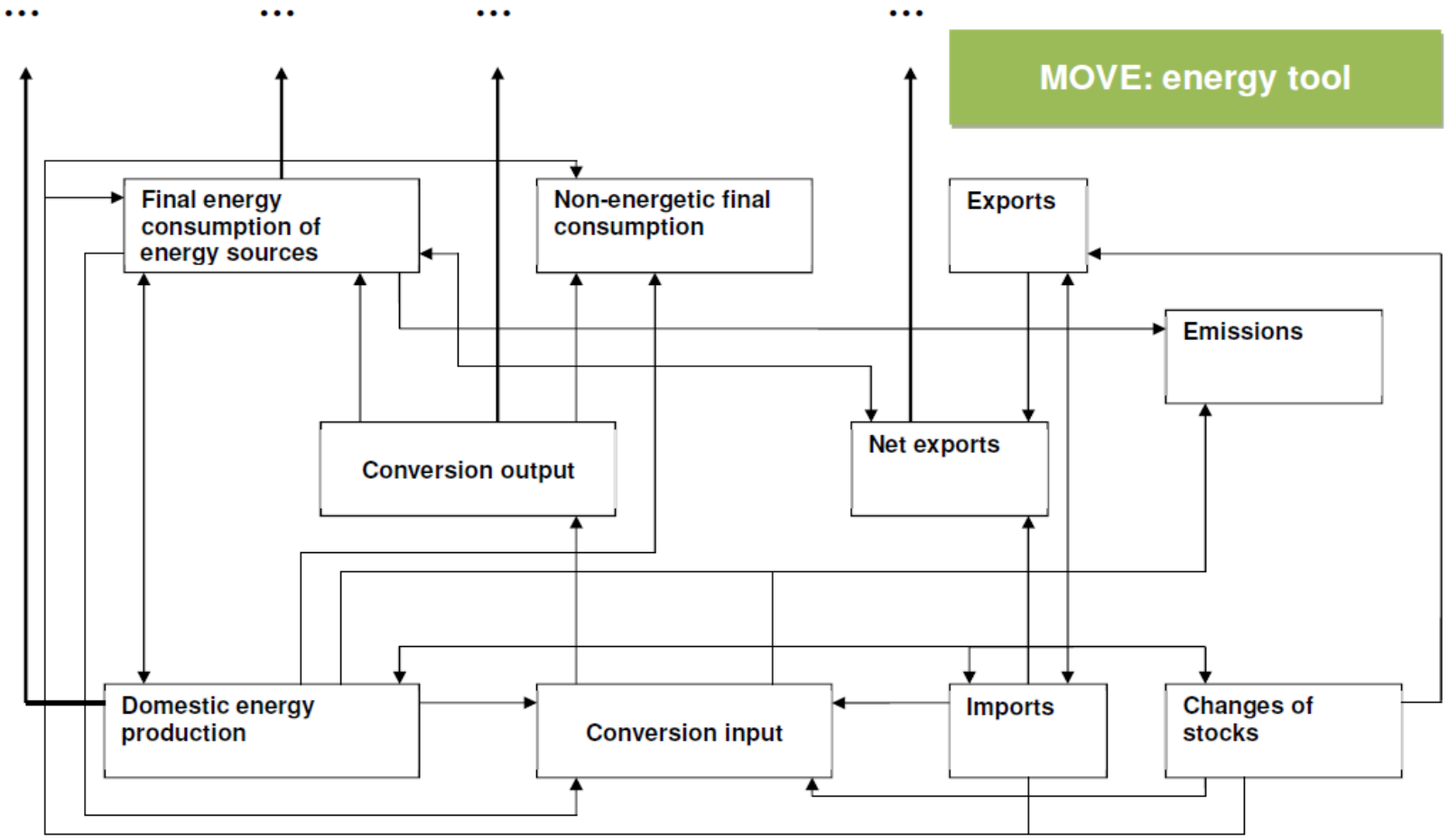
MOVE-Model: Economic module



Source: Kollmann (2009), Tichler (2009)

MOVE - Overview

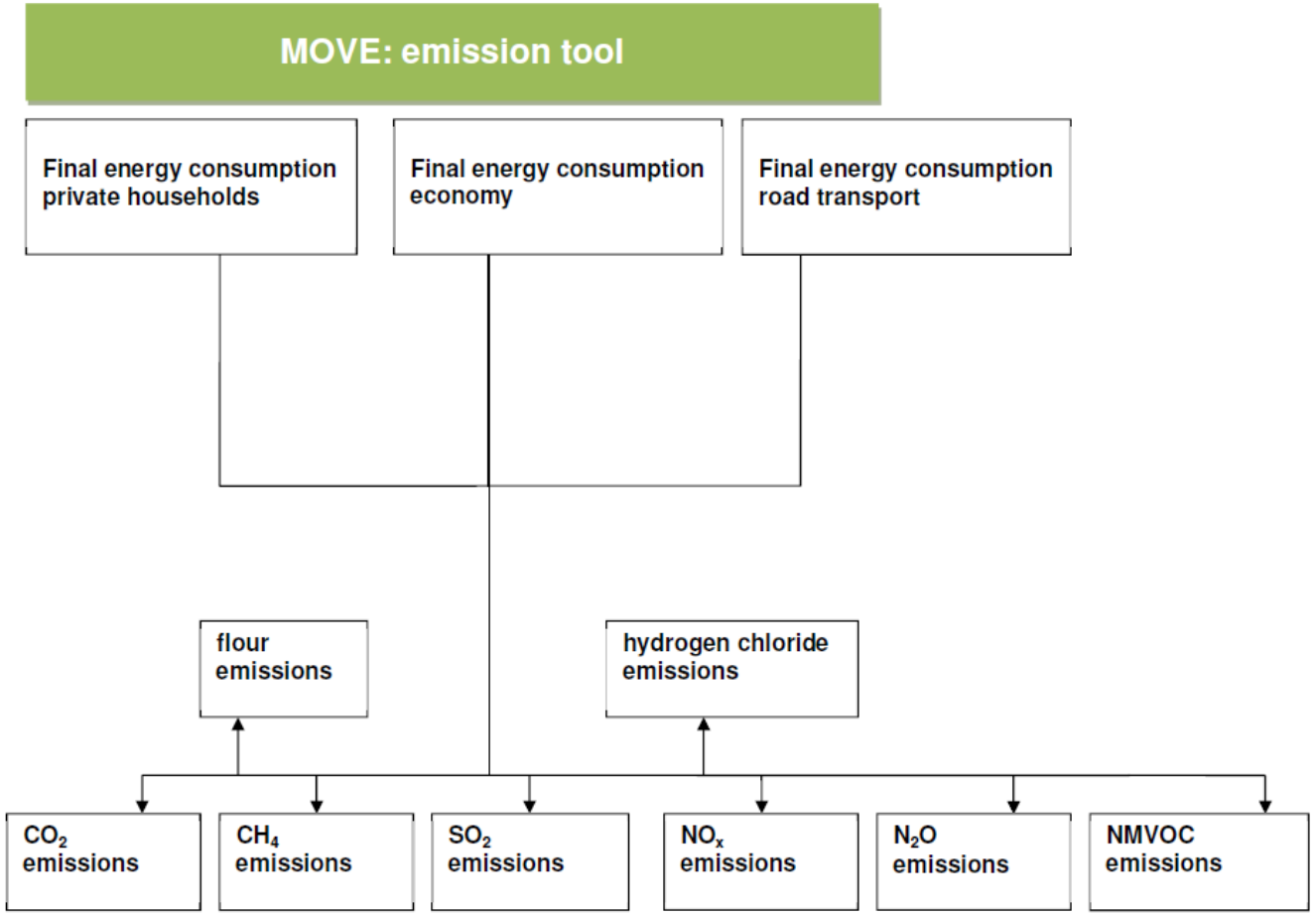
MOVE-Model: Energy module



Source: Kollmann (2009), Tichler (2009)

MOVE - Overview

MOVE-Model: Ecologic module



Source: Kollmann (2009), Tichler (2009)

MOVE – Applications for Upper Austria

Economic analysis of the proposal for actions of the Upper Austrian Program „Energiezukunft 2030“

- Exploring the program’s “Double Dividend”

Sector	Differences per year compared to a business-as-usual scenario	
	Gross regional product [Mio. €]	Employees
Heat	+560	+2,000
Electricity	+220	+550
Transport	+290	+2,600
Total	+1,070	+5,150

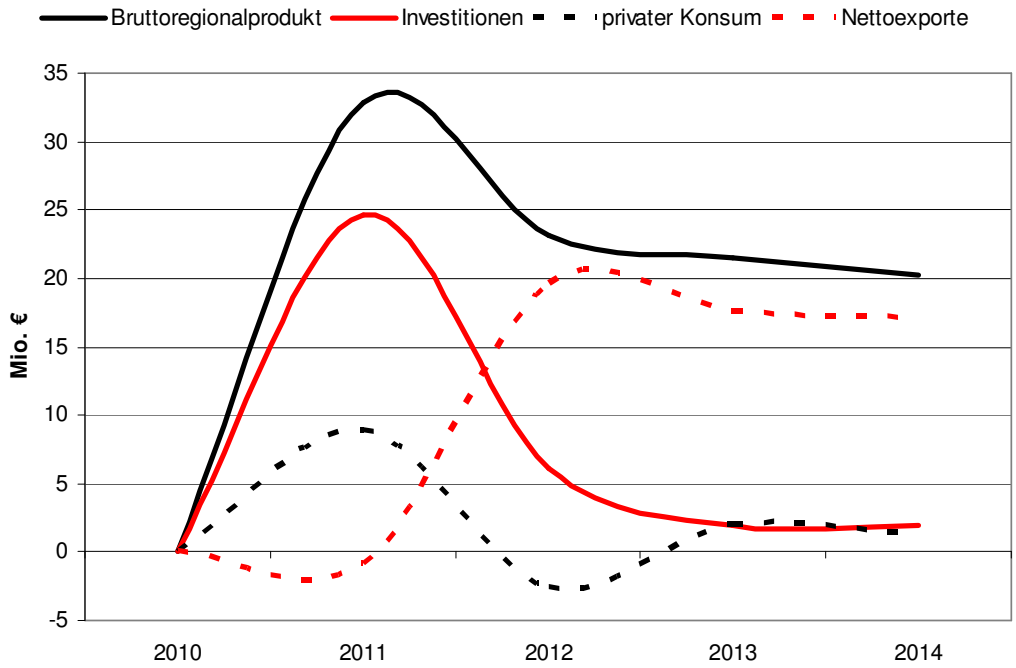
Note: minimum potentials

Source: Tichler, R. et al. (2009) , http://www.esv.or.at

MOVE – Applications for Upper Austria

Economic impact of the construction and operation of the proposed wind farm Silventus and Munderfing

- Exploring the program's "Double Dividend"



Change in GRP
(Ø per year, 2010-2014): +23.5 m €

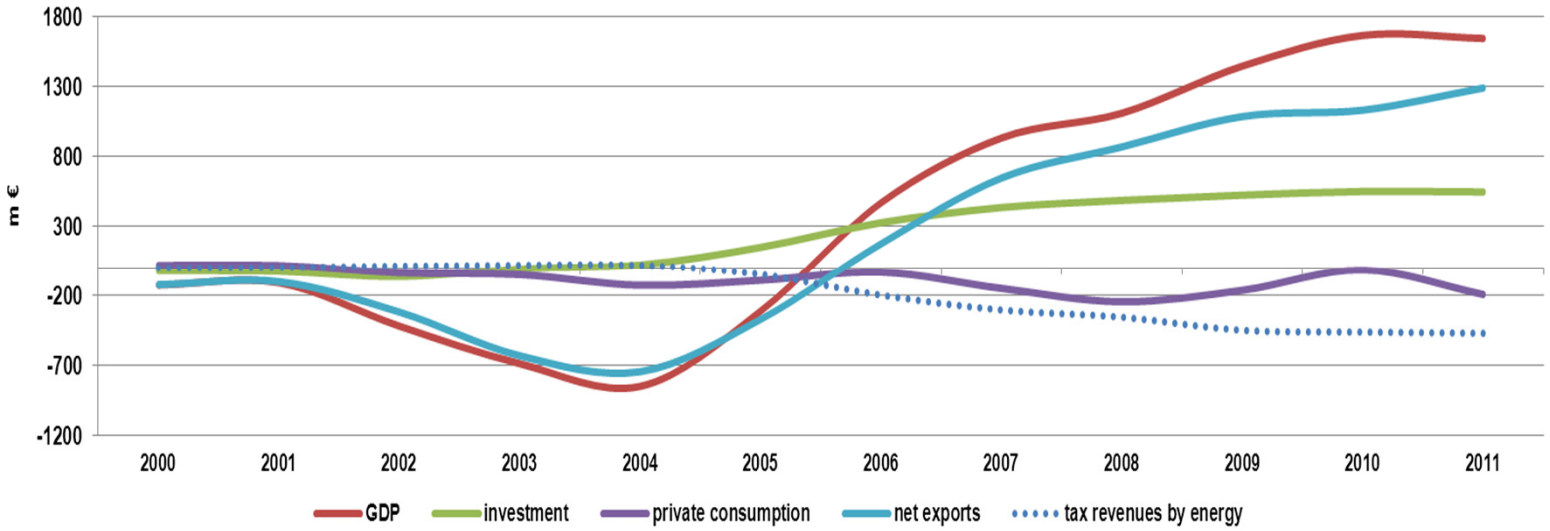
Change in CO_2 emissions
(Ø per year, 2010-2014): -13,500 t

Source: Tichler, R. et al. (2010).

MOVE – Applications for Austria

Economic potentials of renewables in Austria

- Quantification of economic effects by the Austria energy system's changeover from fossil to renewable energy (2000-2011)



Note: Consumption of private households = energetic + non-energetic consumption. Net exports = (energetic + non-energetic) exports – (energetic + non-energetic) imports. The compensation of lower tax revenues is disregarded in the economic effects.

Source: Bointner et al. (2013).

MOVE – Applications for Austria

Economic potentials of renewables in Austria

- Quantification of economic effects by the Austria energy system's changeover from fossil to renewable energy (2000-2011)
- **Effects on public tax revenues**

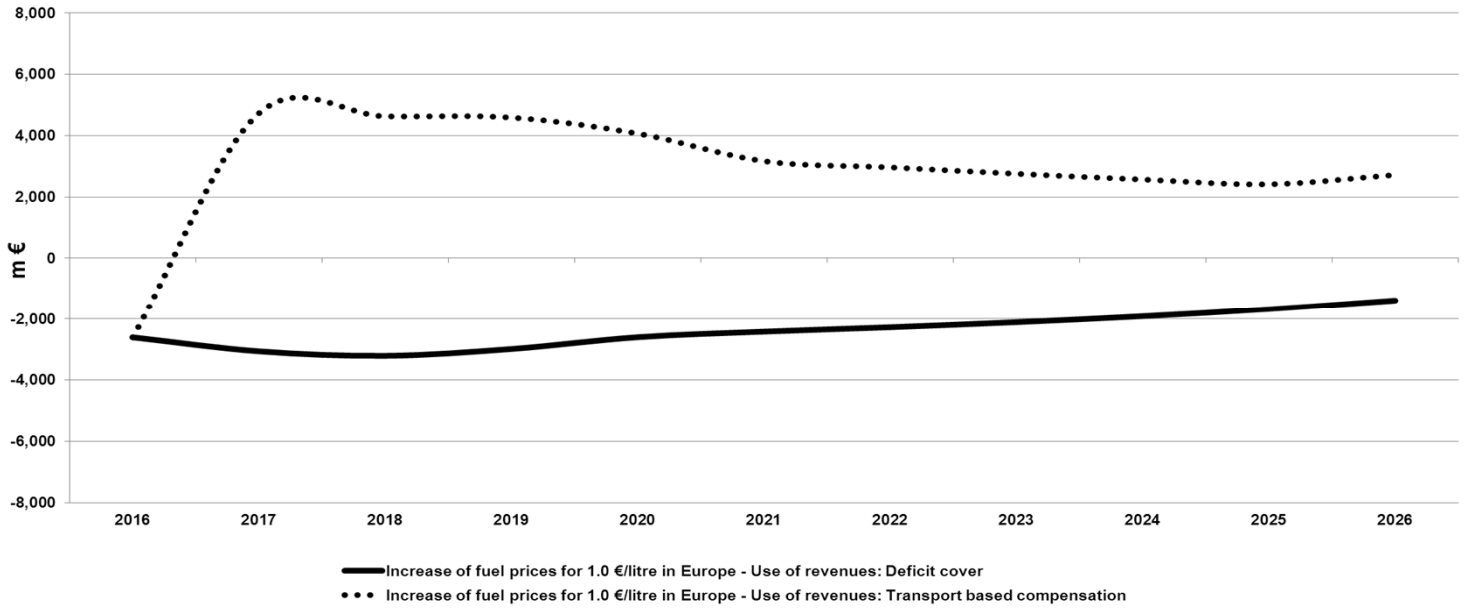
Tax revenues per year (2000-2011) – difference to business-as-usual scenario	
Tax revenue by energy consumption	- 186 m €
Value added tax revenue by non-energetic goods	- 4 m €
Revenues by employees	+67 m €
Total	-123 m €

Source: Bointner et al. (2013).

MOVE – Applications for Austria

Financial policies in the transport sector

- Providing forecasts of indirect effects on economic sectors and private households in Austria due to an increase of fuel prices for 1.0 €/l in the EU - Use of revenues: deficit cover / transport based compensation



Note: Consumption of private households = energetic + non-energetic consumption. Net exports = (energetic + non-energetic) exports – (energetic + non-energetic) imports.

Source: Goers et al. (2014).

MOVE – Applications for Austria

Climate targets 2030

- Consequences for the Austrian energy-intensive industries and the electricity and heat sector

Reduction of GHG emissions in Europe in 2030	*average values* 2010-2020 [m € per year]	2021-2030 [m € per year]	2010-2030 [m € per year]	2030 [m €]
Change of gross value added in the energy-intensive manufacturing sector				
35%	**-220**	**-1,100**	**-640**	**-790**
40%	**-310**	**-1,520**	**-880**	**-1,470**
45%	**-230**	**-1,280**	**-730**	**-990**
Change of gross value added in the electricity and heat sectors				
35%	**-50**	**-240**	**-140**	**-310**
40%	**-50**	**-330**	**-180**	**-420**
45%	**-70**	**-470**	**-260**	**-670**

Note: rounded values

Source: Schneider et al. (2014).

MOVE – Applications for Austria

Climate targets 2030

- Consequences for the Austrian energy-intensive industries and the electricity and heat sector

Reduction of GHG emissions in Europe in 2030	*average values* 2010-2020 [m € per year]	2021-2030 [m € per year]	2010-2030 [m € per year]	2030 [m €]
Change of number of employees in the energy-intensive manufacturing sector				
35%	**-1,500**	**-8,000**	**-4,600**	**-5,900**
40%	**-2,100**	**-11,000**	**-6,400**	**-10,500**
45%	**-1,600**	**-9,200**	**-5,200**	**-7,300**
Change of number of employees in the electricity and heat sectors				
35%	**100**	**-100**	**0**	**-200**
40%	**100**	**0**	**0**	**100**
45%	**100**	**-300**	**-100**	**-500**

Note: rounded values

Source: Schneider et al. (2014).

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MOVE2 – Update of MOVE

- The **main differences** between MOVE and *MOVE2*:
  - *MOVE2* includes additional data for the period 2005 to 2010.
  - *MOVE2* includes effects of the financial and economic crisis and the changes in the behavior and decisions of consumers and producers. For example, it was found that the variation in consumer behavior in such cases lasted slightly longer in the following years as the model MOVE.
  - After including new data points, all estimates were recalculated. This led to adjustments in the estimated coefficients and thus to slight changes in the model calculation based on the economic structure.

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MOVE2 – Update of MOVE

Multiplying factors of investment and consumption in 2015

Investment in sector	Multiplying factor GDP *MOVE2*
Forestry and Fishery	1,03
Mining Industry	1,07
Manufacturing	2,17
Energy and Water Supply	1,30
Construction	1,48
Accommodation and Restaurant	1,64
Transport and Communication and Information Transmission	1,16
Credit and Insurance	1,13
Real Estate and Business Services	1,41
Public Services	1,15
Other Services	1,57
Consumption of private households	***MOVE2***
Non-energetic consumption	1,09

Source: Energieinstitut an der Johannes Kepler Universität Linz.

MOVE2 – Update of MOVE

- Release of **brochure** and **public presentation** in November 2014!

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Thank you for your attention!

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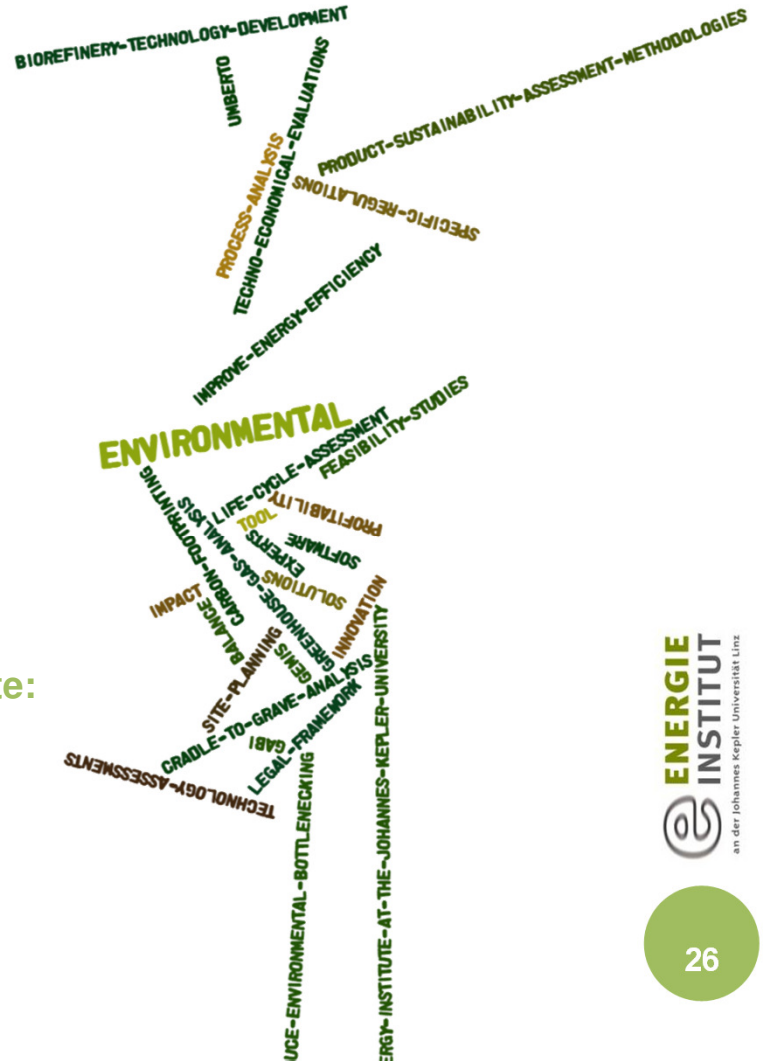

More information on projects are available at the website:

http://www.energieinstitut-linz.at

http://www.energyefficiency.at/

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