



Energy reduction potentials in the EU-27

- Analysis by modelling a White Certificate Trading scheme with TIMES PanEU

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Agenda

- Overview and European climate policy targets
- Approach
 - i. TIMES PanEU
 - ii. White certificates and Scenarios
- Model results
 - i. Final Energy Consumption
 - ii. Primary Energy Consumption
 - iii. Emissions
 - iv. Different sector and country contribution
- Key messages



Overview

Introduction

- Reduction of energy consumption as part of European goals
- CO₂ reduction by fossil fuel switch, renewables, nuclear, CCS and energy efficiency
- White certificate measures implemented on country level (UK, France, Italy, Flanders)
- Evaluating strategies for energy efficiency improvements



European climate policy goals

EC in 2007: 20/20/20 goals

- Energy efficiency: Reduction of 20% compared to reference development [as estimated by Commission in the Green paper on energy efficiency]

November 2008

- Need of European approach for an equitably sharing of reduction targets [Memo-08-699]
- Current measures will lead to energy savings of about 13% by 2020



The Pan-European model (Times PanEU)

Model description:

- PEM is a 30 region (EU 27 + NO, CH, IS) partial equilibrium energy systems, technology oriented bottom-up model
- Time horizon: 2000-2050
- 12 time slices (4 seasonal, 3 day level)
- GHG: CO₂, CH₄, N₂O, SF₆
- Others pollutants: SO₂, NO_x, CO, NMVOC, PM2.5, PM10



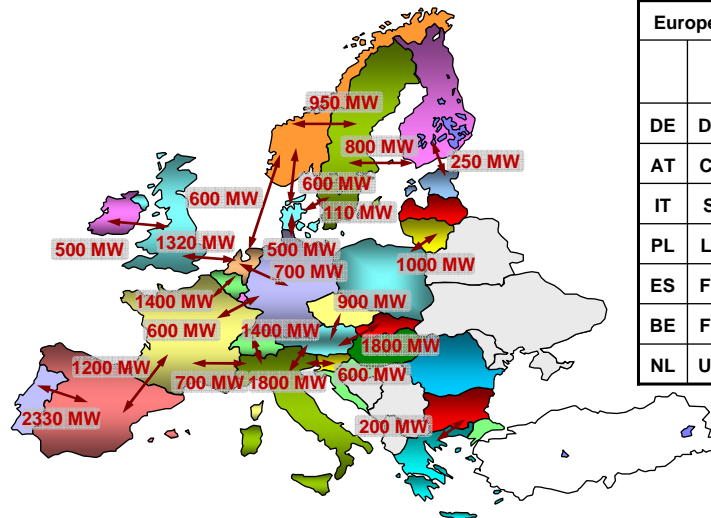
The Pan-European model (Times PanEU)

Model description:

- **SUPPLY:** Explicit modeling of reserves, resources, exploration and conversion
- **ELECTRICITY:** Public electricity plants, CHP plants, heating plants, auto-producers
- **DEMAND:**
 1. **Agriculture**
 2. **Industry:** Energy intensive industry (iron and steel, aluminum, copper, ammonia and chlorine, cement, glass, lime, pulp and paper), Other industries
 3. **Residential and Commercial:** Space heating/cooling, water heating, appliances and others
 4. **Transport:** Passenger, Freight (different transport modes: cars, buses, motorcycles, trucks, passenger trains, freight trains) Aviation, Navigation.
 5. **Country specific characterization of end-use technologies**



Regions in the Pan-EU model and planned electricity interconnection extensions



European Priority Projects			
		P in MW	Year
DE	DK	500	2012
AT	CZ	900	2009
IT	SI	800	2011
PL	LT	1000	2013
ES	FR	1200	2009
BE	FR	400	2015
NL	UK	1320	2010



Modelling white certificate trade

White Certificates Trading in TimesPanEU

- European-wide trade
- Certificates for reduction of final energy respective primary energy
- Certificates for all energy carriers (including all renewables)
- Certificates for all demand sectors
- No regard of costs

Balancing

- Efficiency method
- => valuing commodities in model restriction accordingly



Scenario Definition

cert_final

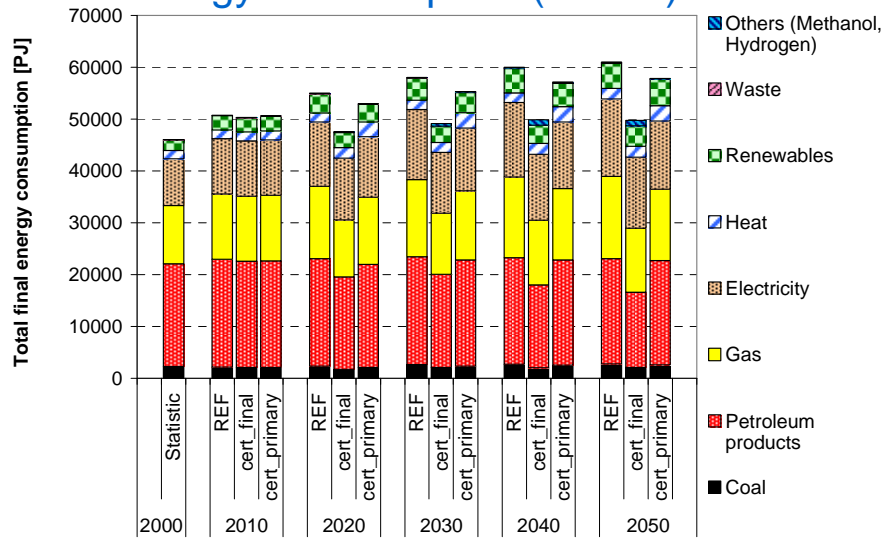
- White certificates for Reduction of Final Energy Consumption
- Base: Reference run
- 13% - 20% reduction (2020-2050)

cert_primary

- White certificates for reduction of Primary Energy Consumption
- Base: Reference run
- 13% - 20% reduction (2020-2050)

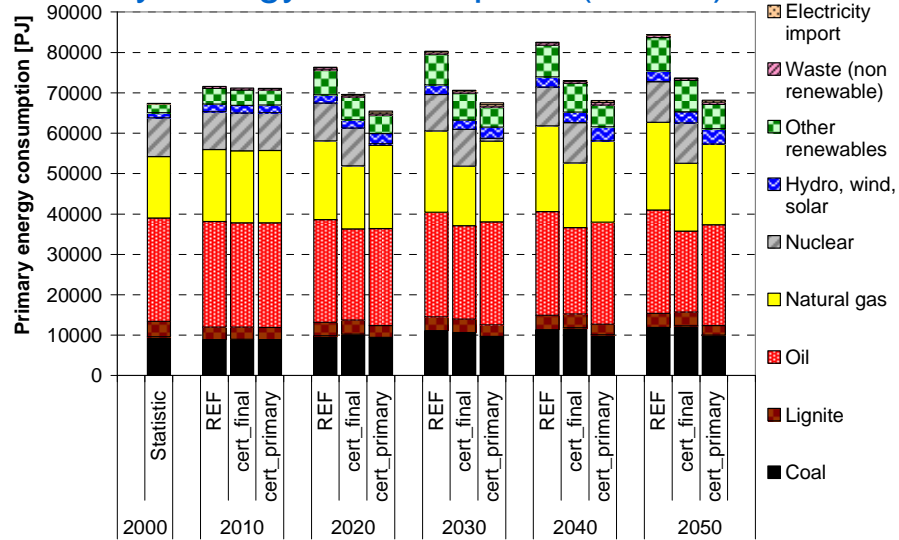


Final Energy Consumption (EU-27)



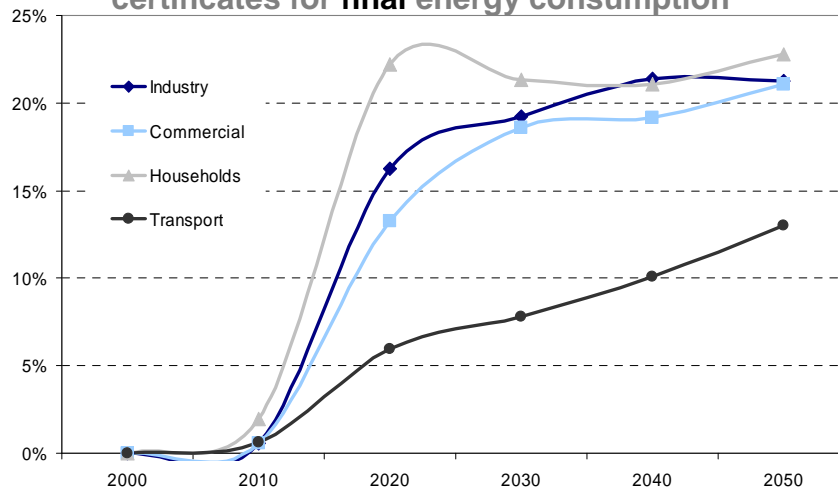


Primary Energy Consumption (EU-27)



Reduction of FEC by sectors (compared to REF)

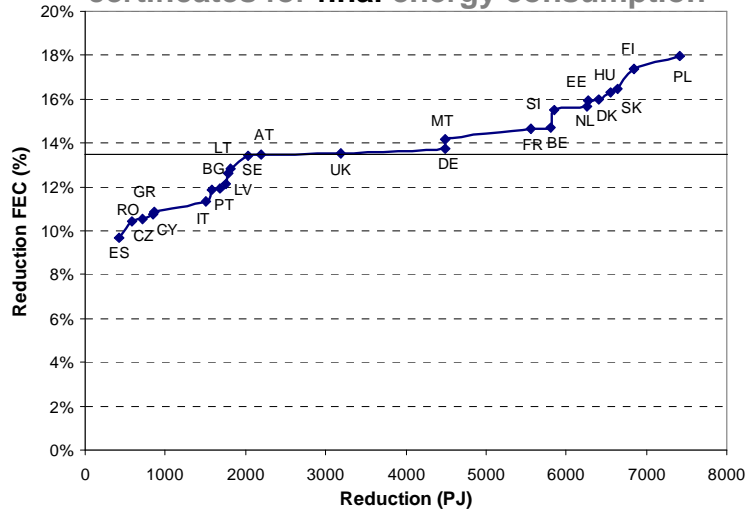
certificates for final energy consumption



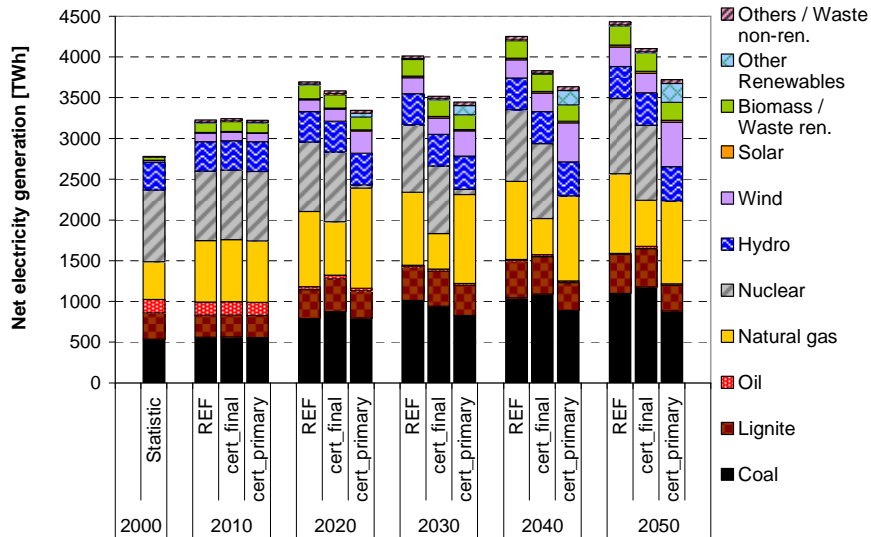


Reduction potentials by country (2020)

certificates for final energy consumption

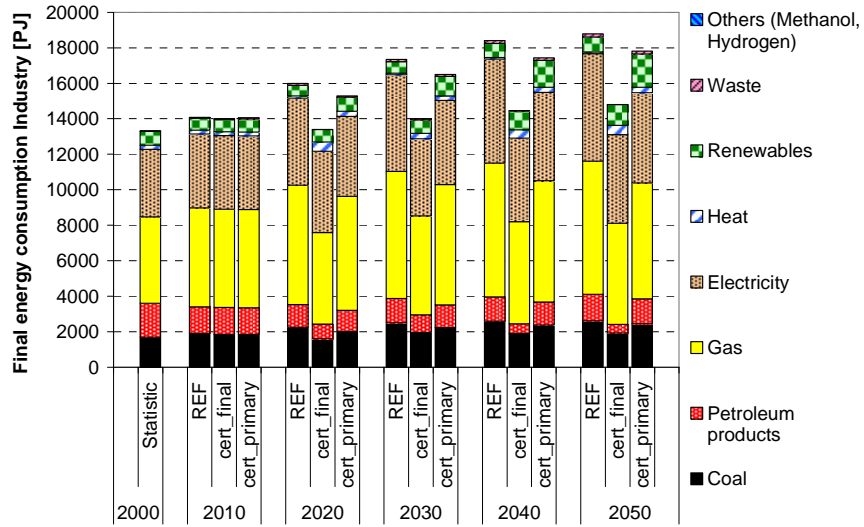


Sector view: Electricity Generation

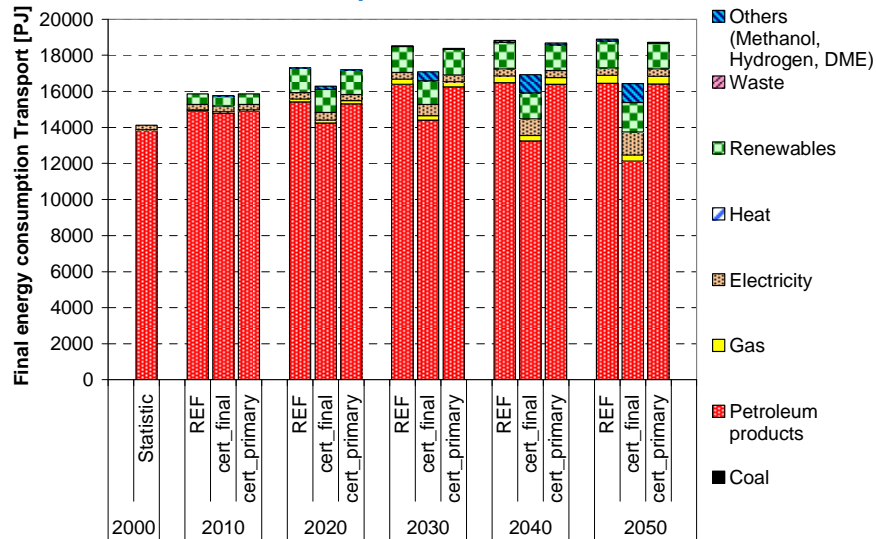




Sector view: Industry

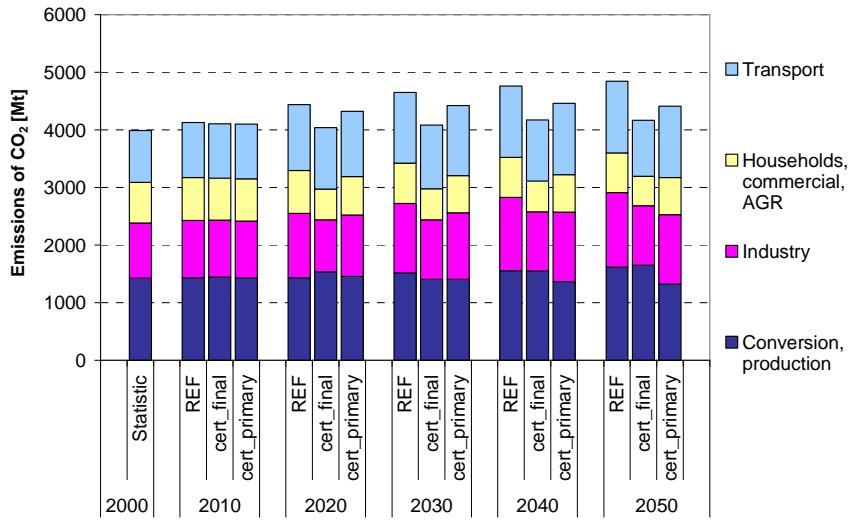


Sector view: Transport

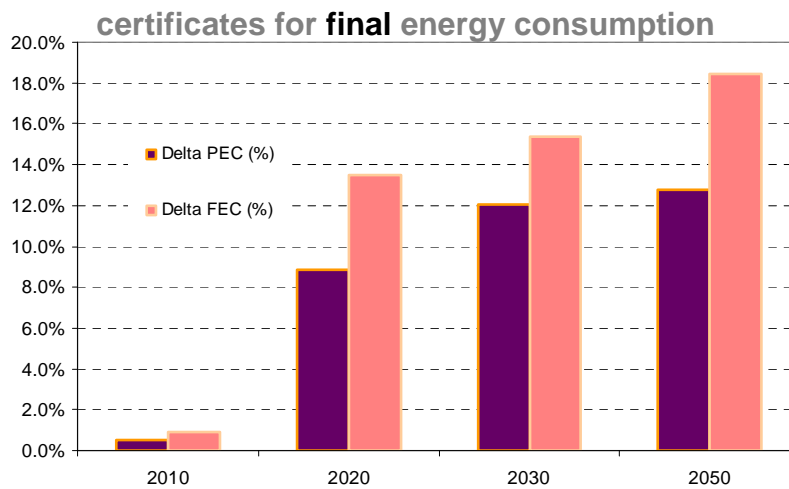




CO₂ Emissions

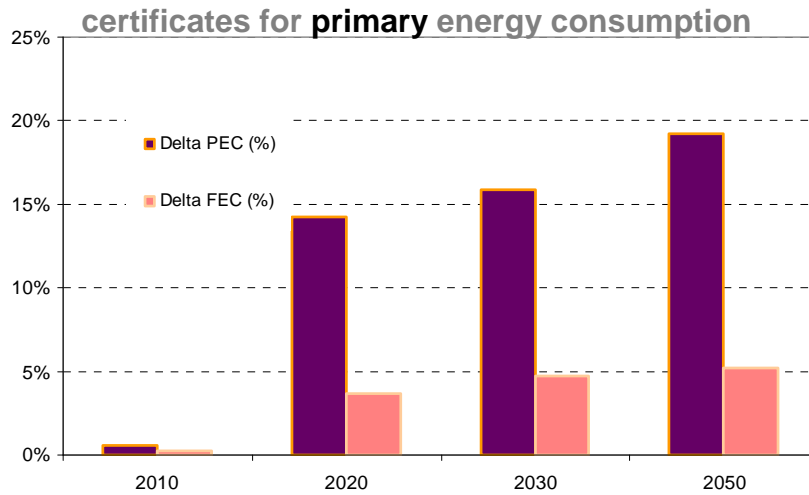


Comparison reduction FEC to PEC (EU-27; compared to REF)

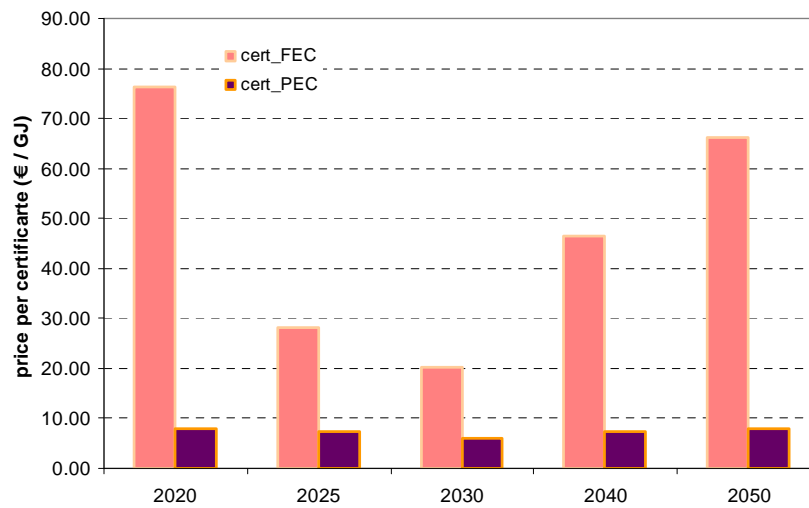




Comparison reduction FEC to PEC (EU-27; compared to REF)



Prices of white certificates





Key model results

White certificates **final** energy consumption

- Higher use of district heat (increased use of public CHP, less autoproducer) and higher share of ELC
- Reduction of FEC stronger than PEC
- Reduction driven by Residential&Commercial, Industry and on a lower level also transport

White certificates **primary** energy consumption

- Higher use of wind and other renewables, less use of nuclear (clear structural change in electricity generation)
- Just small reduction of final energy consumption (reduction stays in conversion/production sector)



Key messages

Main findings

- European approach for sharing of reduction goals necessary and cost effective by white certificate trade
 - i. Different contribution between countries
 - ii. Different potentials in demand sectors
- Reduction initially caused by Households, later on also industry and commercial (less transport)
- Trading of FEC certificates leads to lower emissions (compared to certificates of primary energy)
- 20% reduction of FEC compared to Reference case doesn't seem to be possible



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