The Cost of Counteracting Policy Instruments :

The case of feed-in-tariffs, CO_2 emission trading and on-budget aids to natural gas

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Overview

The problem

A possible solution

Methods

(Portuguese Energy System)

Results

CO_2 emissions

Electricity generation technologies

Costs

Context: counteracting policy instruments

The disarticulation of energy and environment policy instruments generates costs and inefficiencies that stretch already limited government budgets and hamper the efficiency and effectiveness of all policy instruments in place[a]

CO_2 charges vs. on-budget aids to fossil infrastructures
subsidies to renewable electricity vs. restrictions of hydro

Policy makers have been taking efforts to integrate environment and energy policy goals, without much success

Policy integration efforts so far based on top-down subjective qualitative assessments and seem to be nothing more than vague statements on the integration of equally vague broad policy goals

[a] Briassoulis, 2004; Greening and Bernow, 2004; RIVM et al., 2001; EU Commission COM(2004) 394 final

A more robust quantitative approach is needed to ensure successful policy integration

Presented a quantitative bottom-up approach to

1. estimate the losses or gains on effectiveness and cost-effectiveness of interacting policy instruments
2. assess the relevance of counteracting effects between policy instruments and thus to set priorities for their integration, and to test more integrated policy designs

The bottom-up optimization model TIMES_PT is used

(Implementation of the TIMES model generator for Portugal initially developed within the NEEDS EU project)

Simulation of different combinations of existing policy instruments and comparative analysis of results regarding CO_2 emissions; technology profile for electricity generation; total system costs and CO_2 marginal abatement costs

Feed-in tariffs, EU ETS and on-budget aids to natural gas infrastructures

Methods

Assumed CO2 national emission cap +27% increase of 1990 emissions

EU-ETS

Electricity generation, refineries and energy intensive industry

Allocation = maintain 2000 emissions

Allowance price 21€/t CO_2

Only buying is modelled

Feed-in tariffs

Following legislation in place, subsidies to generated electricity (€ cents/kWh):
- wind 7.90
- small hydro 8.20
- biogas 10.50
- wood waste 11.00
- waves 28.00
- PV 46.50

Aids to gas

Min. electricity generated from gas combined cycle (existing & new) corresponding to at least 1100 MW installed capacity in 2010-2030

In 2007 1176 MW in place and attributed permits for more 3200 MW

Simulation from 2000 to 2030 – analysis of results for 2020

Policy \ Scenario	None	All	ETS	FI	Gas	ETS+FI	ETS+Gas	Gas+FI
EU-ETS		✓	✓			✓	✓	
Feed-in tariffs		✓		✓		✓		✓
Aids to gas		✓			✓		✓	✓

Snapshot of the Portuguese energy system

High dependency of imported fuel

- In 2005 84% of national primary energy demand met with imported oil, coal and gas
- Only national energy resources are renewables - hydro for power generation, and biomass used both in CHP in industry and in the residential sector
- In 2005 transport accounted for 44% of national energy demand followed by industry (26%)

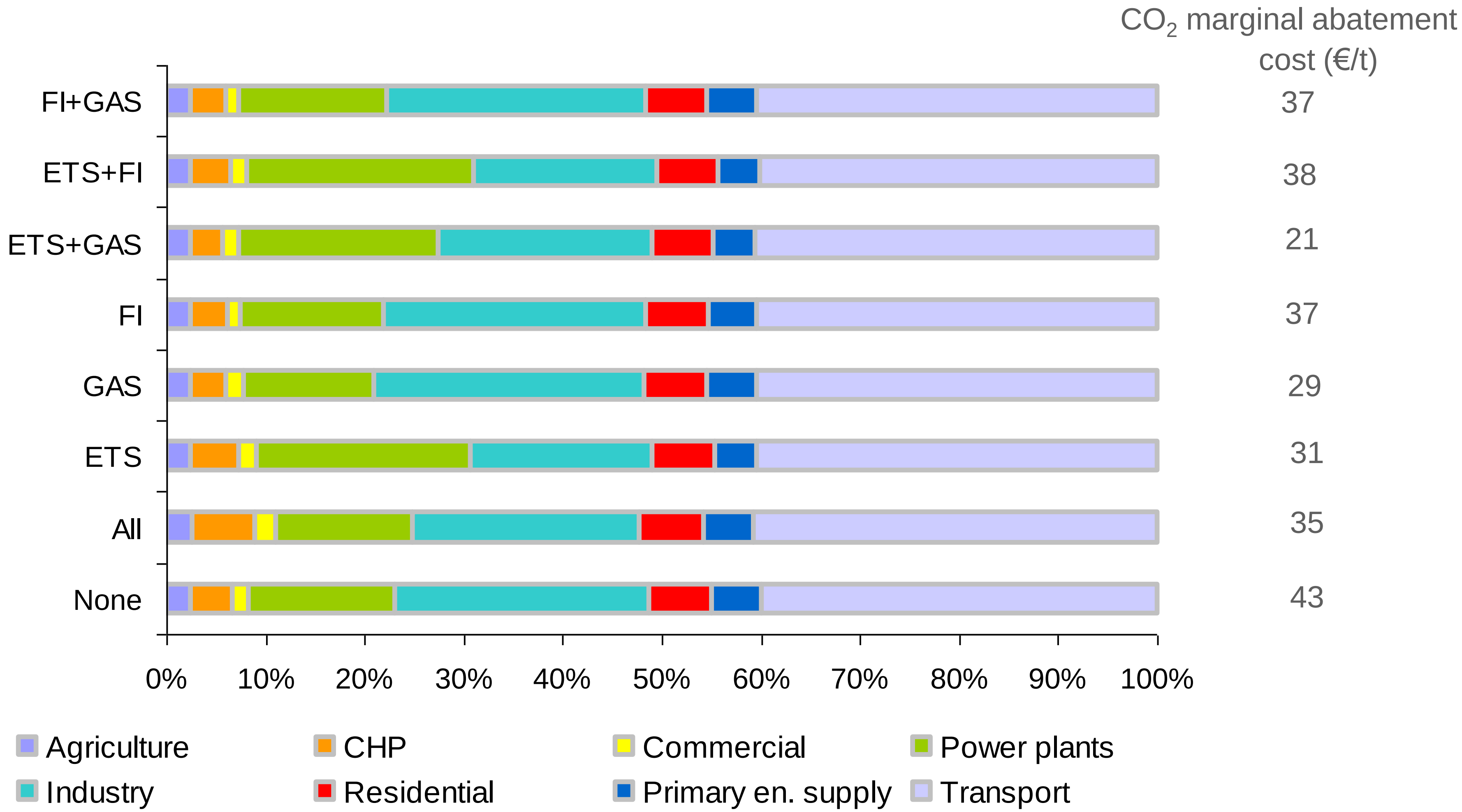
Electricity generated mostly from fossil exogenous resources

- coal, gas and oil accounted for 65-83% of generated electricity in1999-2007
- hydro accounted for 39-11% of total electricity generated in 1999-2007
- other resources are wind and biomass: 20% and 16% of 2007 renewable electricity

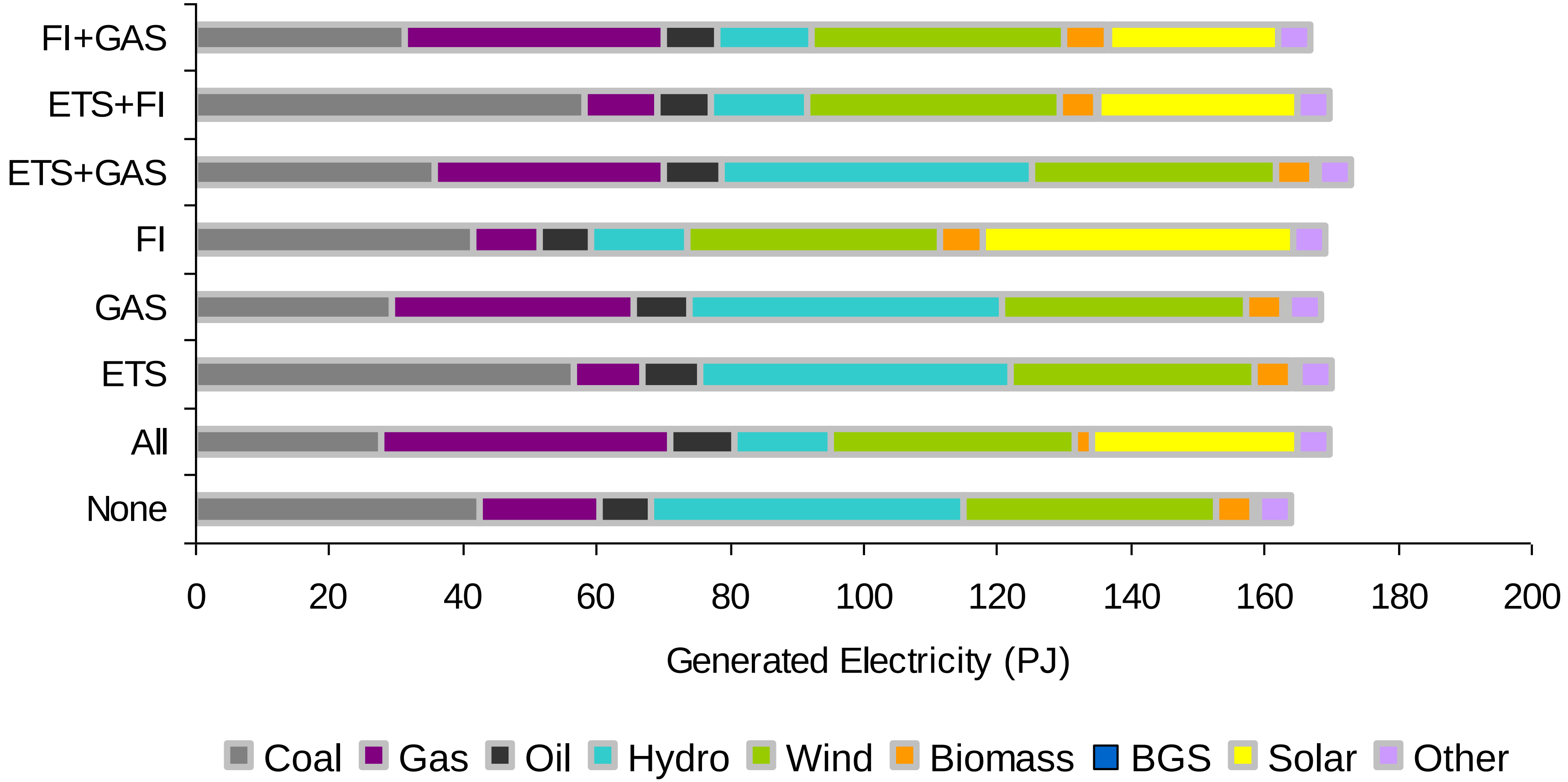
Nuclear power is not used and is considered politically unacceptable

Kyoto/burden sharing target is of +27% 1990 levels but national forecasts point to growth of 45- 48% by 2010 and 41- 38% by 2020

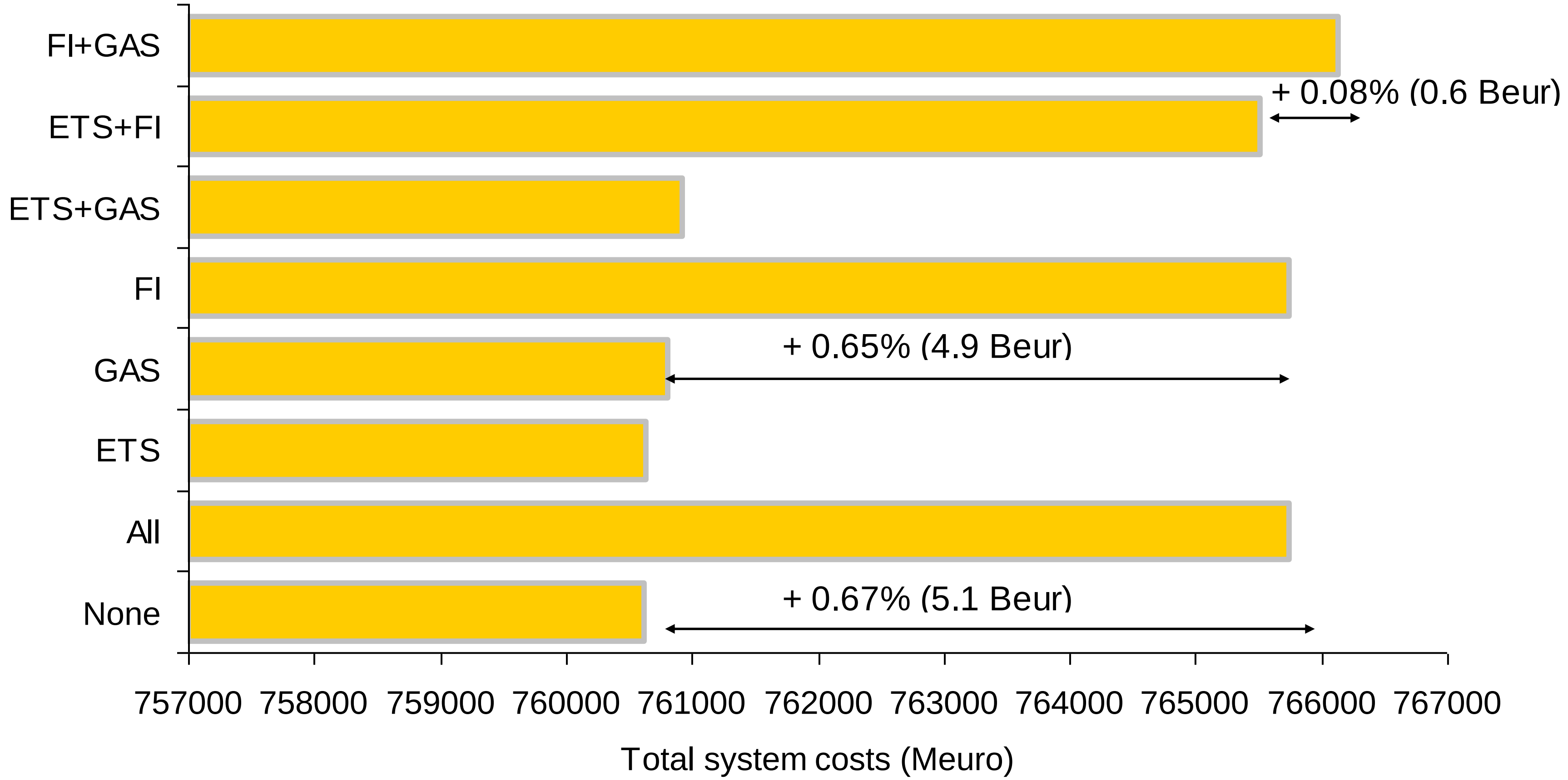
Results | Sector contribuiton to CO_2 emissions in 2020



Results | Electricity generation technologies in 2020



Results | System costs (2030)



Conclusions

1. The most costly counteracting policy instruments are feed-in tariffs and aids to natural gas. Its combined implementation increases total energy systems costs by 0.7% compared to a case where only aids to gas are modeled

2. The counter effects of the feed-in tariffs and aids to gas lead, in 2020, to:

- i) Significant variations on the penetration of electricity generation capacity, especially solar PV and on the resources used for electricity generation
- ii) increase in CO_2 marginal abatement costs of 0-8 €/t CO2.

3. On the other hand, the combined implementation of the EU-ETS and aids to gas leads to reduced CO_2 marginal abatement costs (from 31 and 29 to 21€t/CO2).

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