POTEnCIA

Overview, scope and purpose

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Joint Research Centre
the European Commission's
in-house science service

POTEnCIA

Policy
Oriented
Tool for
Energy and
Climate change
Impact
Assessment

OVERVIEW

A model of the European energy sector

POTEnCIA is a mathematical model designed to represent the economically driven functioning of the European energy markets

- Assessing the impacts of strategic EU energy-related policy options
- Coping with the increasingly complex structure of the energy market and related policies

Geographical coverage:

EU Member States (and accession countries, neighbouring countries)

Time horizon:

2050 (and beyond) in **annual** steps

MODEL INTRODUCTION

POTEnCIA follows a ***hybrid partial equilibrium*** approach combining

- behavioural decisions
- detailed techno-economic data
- *one year lag* applies for equilibrium prices

Representative agents response captured through *non-linear* causational equations

The output of the model consists of

- detailed energy balances and related CO_2 emissions (ETS explicitly addressed)
- energy system costs and prices
- activity indicators and related process CO_2 emissions (where applicable)
- installed equipment capacities, characteristics and rate of use (both for the demand and the supply side)
- dynamic technology improvements by Member State (depending on policy assumptions)

MODEL USE

The model can analyse the effects of:

existing and proposed legislation (EU wide and/or Member State specific) related to energy production and use

- CO_2 emission reduction policies (other greenhouse gases addressed through linking to other modelling tools)
- policies aiming at the increased use of renewable energy sources
- policies focusing on increased efficiency of energy use
- policies promoting the use of alternative fuels
- policies accelerating or delaying technology progress and deployment, as well as introducing standards and/or labelling
- different pricing regimes and taxation policies
- different regimes for the electricity market related to decentralisation and liberalisation
- price peaks caused by scarcity of certain energy carriers
- alternative behaviour of representative agents (both energy suppliers and consumers) affecting both their investment decisions and the use of equipment
- policies related to the development of energy networks (including the impact of modifications in the cross-country interconnection capacities) *foreseen for Autumn 2016*

MODEL USE

The model *cannot*:

- carry out engineering analysis on explicit technological options beyond the level of detail present in the model

  e.g. policies related to eco-design and/or labelling are addressed in an implicit manner

  however, the model **can** provide information on the evolution of the overall characteristics of technology groups that are built in line with eco-design definitions

- capture phenomena that occur in fractions of an annual step

  e.g. random fluctuation in intermittent renewable energy sources supply

  however, the model **can** analyse the impact of such fluctuations through snapshots

- assess energy policy impacts on the economy

  however, the model **can** provide quantified information on the impact of such policies at the level of activity

- address issues related to spatial information and representation

  e.g. electricity and gas grids topology, wind parks locations

  however, the model **can** capture the volume and investment cost for networks capacities expansion at country level

Implementation of Policies

POTEnCIA can address both **explicitly** defined policies and those that are **implicit**, including not yet defined future policies

Explicit policies are directly assessed in the model

- Policies related to energy taxation
- Policies related to support schemes for the replacement of installed inefficient equipment (e.g. subsidies on capital costs of cars)
- Minimum efficiency standards for technology options
- Financial support policies
  - *Feed in tariffs*
  - *Investment incentives*
  - *Low interest loans*
  - *Tax reductions*

Implementation of Policies

Implicit policies that link to meeting a certain target

- They are addressed through the *dual value* (shadow price) of the corresponding constraint

- This dual value acts as an incentive on the decision-making concerning
  - *the investment in new energy equipment, and/or*
  - *the operation of the installed equipment*
- Depending on the policy the dual value may give rise to additional costs
  - *for example auctioning for the ETS versus introducing a carbon value for the non-ETS sectors*
- The effort required in meeting the specific target can be reflected and quantified
- The dual value may be restrictive even in the case that the policy options have a positive NPV

Assessing EU Energy System Policies

Energy Efficiency	Renewable Energy	CO_2 Emission Reduction
Technology oriented policies (e.g. efficiency/emission standards)		

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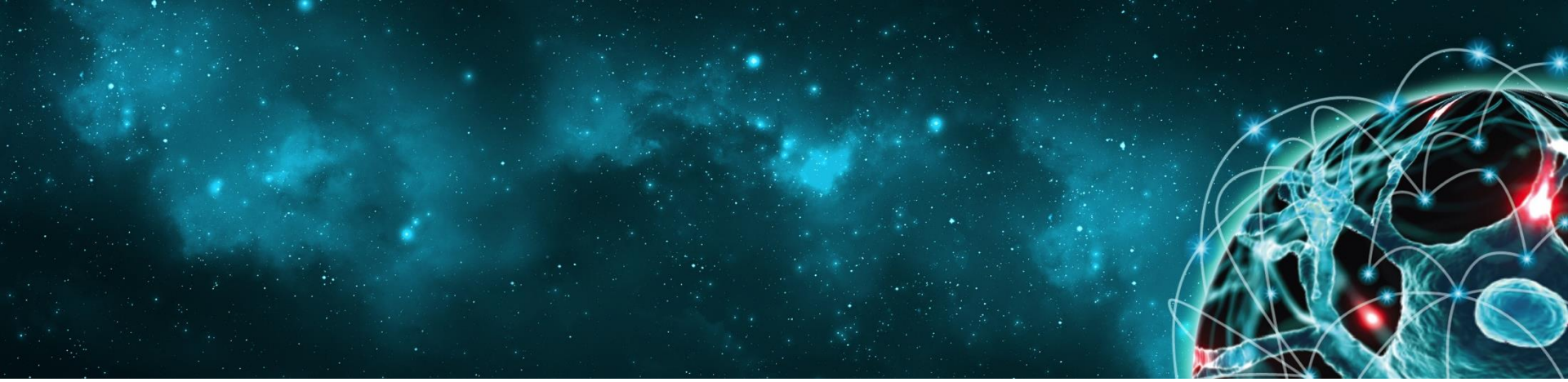
Energy Efficiency	Renewable Energy	CO_2 Emission Reduction
Technology oriented policies (e.g. efficiency/emission standards)		
Price driven policies (e.g. feed-in tariffs, investment incentives, financial support schemes)		
Quantity based policies (e.g. quota obligations, emission reduction targets, efficiency targets)		
Efficiency value	Renewable support value	Carbon value ETS price
Policies aiming at behavioural changes		
Labelling, consumers awareness	Removing non cost barriers	Carbon footprints
Specific policies		
Policies to accelerate the turnover of stock	Promotion of self-consumption	Average CO_2 emissions standards for new vehicles
	Dispatching rules	



Thank you for your attention

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