

The European Commission's science and knowledge service

Joint Research Centre



POTEnCIA and JRC-IDEES

Overview, scope and purpose

WORKSHOP ON MODELLING OPTIONS FOR NECPS IN THE ENERGY COMMUNITY

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ENHANCING EU POLICY SUPPORT

The tools and process

Understanding the past...



**JRC-Integrated Database of the
European Energy System
(JRC-IDEES)**

...to better assess potential futures



**Policy-Oriented Tool for Energy and
Climate Impact Assessment
(POTEnCIA)**

**... within an interactive and transparent process
involving Member States' experts**

POTENCIA

Policy Oriented Tool for Energy and Climate change Impact Assessment

Actuality is to potentiality, Aristotle tells us, as "someone waking is to someone sleeping, as someone seeing is to a sighted person with his eyes closed, as that which has been shaped out of some matter is to the matter from which it has been shaped" (1048b1–3).

<http://plato.stanford.edu/entries/aristotle-metaphysics/#ActPot>

*El ser no sólo se toma en el sentido de sustancia, de cualidad, de cantidad, sino que hay también el ser en **potencia** y el ser en acto, el ser relativamente a la acción. (Aristóteles, Metafísica, libro IX, 1).*

http://www.webdianoia.com/aristoteles/aristoteles_meta_4.htm

THE POTENCIA MODEL

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

Scope

- Energy system (demand and supply)
- EU Member States
- Time horizon until 2050 (and beyond) **in annual steps**
- Comparative scenario analysis

Key features

- Domain for policy action
- Radical changes and new challenges
- Increasingly complex structures
- Technology dynamics
- Reflecting uncertainties

... while capturing behavioural responses

WHAT FOR?

Analysing the main energy system related policy pillars:

Energy efficiency

Renewable energies

Climate change

Market integration

through

Price signals

Subsidies; premium tariffs

Technology standards

Eco-design, CO₂ standards for vehicles

Quantity constraints

Renewables quota; ETS cap; minimum fuel blending

Non-energy measures

Building codes

Behavioural policies

Labelling; Awareness campaigns

Market conditions

Liberalisation; decentralisation

Constrained by

Sectoral detail

Time step

Policy impacts on the economy

Spatial dimension

engineering analysis performed at the level of technology groups

fractions of an annual step addressed through snapshots

link to appropriate modelling tools

network related volumes and costs still captured

POTENCIA MODEL OUTPUT

Model assumptions

- *Macroeconomic drivers*
- *Demographics*
- *International fuel prices*
- *Policy assumptions*

Activity levels and use of stock

- *Industrial production levels, transport activity by mode, etc.*
- *Rates of use*
- *Investment in new equipment*
- *Idle equipment*
- *Prematurely replaced equipment*

Techno-economic characteristics of installed equipment

Distinguishing per vintage

- *Typical sizes*
- *Efficiencies*
- *Costs (capital, fixed, variable)*

Energy use and CO₂ emissions

- *from aggregates at sectoral level to end-use specific*
- *fuel disaggregation in line with EUROSTAT nomenclature*

Cost elements

Energy system costs

- *Energy equipment related*
- *Policy related*
- *Stranded costs*
- *Infrastructure related*

Fuel prices

- *Sector specific*
- *Production, transmission and distribution costs accounted for*
- *Price elements considered*
- *pre-tax prices, excise taxes and VAT, end-user prices*

ANALYSING POLICIES WITH POTENCIA

POTEnCIA is designed to perform **comparative** analysis of scenarios

"Projections are not forecasts"

A "**central**" scenario needs to be defined

- *Reflecting a plausible evolution of the energy system, while*
- *incorporating policies and measures in place*

The internal coherence of the model enhances robust scenario analysis

minimising the need for exogenous interventions

Assessment of the impact of specific (policy) assumptions with respect to the "**central**" scenario

- POTEnCIA can address both explicitly defined policies and those that are met through policy signals
- Different ways of representing policies and targets
 - *Year specific and/or cumulative*
 - *Quantity based and/or cost based*
- Multiple targets can be addressed simultaneously
 - *Involving "equivalent" effort or prioritising scopes*
- The geographical/sectoral scope is also flexible
 - *From sector and country specific to simultaneous EU wide solutions*

DEVELOPING THE 'CENTRAL' SCENARIO

... involves a collaborative process

The 'Central' scenario is developed in close collaboration with Member States and other Commission services

- Understanding and correctly reflecting the national energy systems
 - **JRC-IDEES database**
 - *Exchanges with national experts on-going*
- Agreeing in **key future assumptions**
 - *macro-economy and demographics*
 - *international fuel prices*
 - *technology characteristics*
 - *envisaged activity levels*
- Understanding the model features and scope
 - *illustrative "Entry-point" stylised scenario*
- Addressing **country-specific characteristics**
 - *incorporation of country specific policies in place*
 - *inclusion of on-going investments plans*
 - *reflection of envisaged evolution of national energy systems in a European wide context*

THE INTERACTIVE PROCESS

Key elements of the structured exchange with national experts

Special Groups

- on JRC-IDEES and on POTEnCIA
- a stable framework for exchanges
- ... and support capacity building

Meetings

- 1st POTEnCIA WS (Feb 18)
'Entry point' and assumptions
- 2nd JRC-IDEES WS (May 18)
JRC-IDEES2015v0.9
- 2nd POTEnCIA WS (Nov 18)
preliminary results draft
'Central' scenario

& bilateral meetings

Internet platform

- structured exchange of information
- access upon request
- exchange assumptions, draft results
- but also comments and relevant material

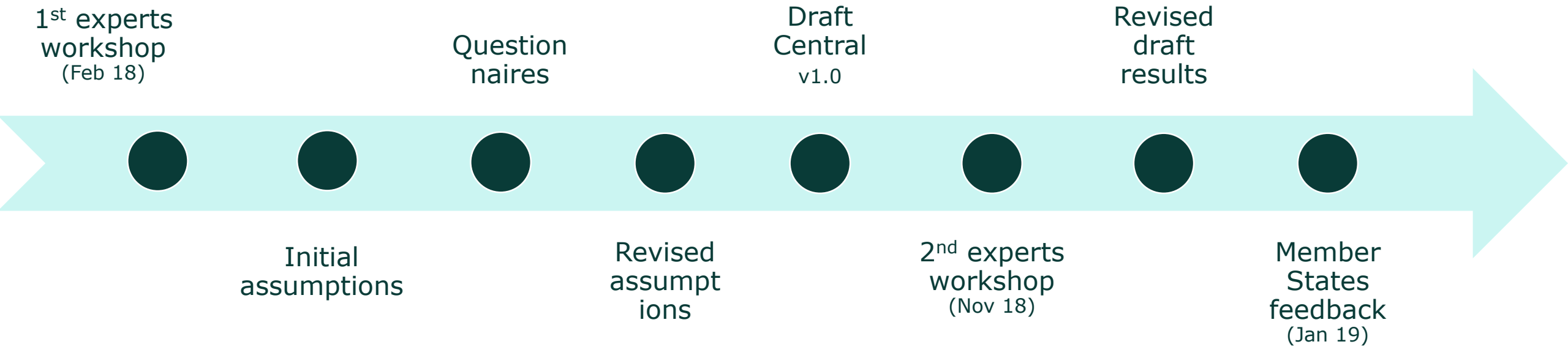
*JRC Research
Collaboration Portal*

<https://rcp.jrc.es>

... complemented by informal interaction by Email, phone etc.

DEVELOPING THE 'CENTRAL' SCENARIO

Interactive process



JRC-IDEES DATABASE

An **open source** complete database of the energy system and all associated factors

- EUROSTAT compliant
- Time horizon: 2000-latest statistical year on an annual basis (currently: 2015)
- Geographical coverage: EU Member States

FIRST-OF-ITS-KIND



Published in July 2018 [<http://data.jrc.ec.europa.eu/dataset/jrc-10110-10001>]

More than 250 registered users

MOTIVATION

All modelling tools need to put together the statistical data that they use

Decomposition of data as to match the level of detail represented in the model structure

JRC-IDEES forms **an integral part** of the POTEnCIA model

- *reflecting the current structure and properties of the energy system*
- *identifying existing equipment vintages and characteristics*
- *capturing behavioural aspects with regards to the use of equipment*

... but can be used as a stand-alone product for different purposes

KEY FEATURES

By construction, the database **matches** Eurostat statistical data

Consistent approach throughout all sectors, equipment vintages, and countries

Takes into account Member States and sector specific characteristics

- the data decomposition within each sector is tailor-made for each country

Explicitly quantifies the contribution of non-energy equipment related factors in meeting energy service

- better identification of the characteristics of energy equipment

Incorporates a very high level of sectoral detail and disaggregation by end-use

- making it usable as input for many different models

Decomposes energy consumption down to the level of one representative consumption unit (e.g. household, appliance, car)

- explicitly distinguishes between technical and behavioural characteristics
- creates a basis for defining the scope for policy action

WHAT CAN BE FOUND IN JRC-IDEES

Historical **statistical** data concerning:

Demographics

The economy

Activity levels

Energy use

complemented by

The bulk of the figures in the database are **own estimates**

Sectoral detail

at the level of end uses of energy

CO₂ emissions

detailed ETS sectors representation

Technology data

sizes, efficiencies, costs

Energy equipment stock

Vintages, equipment characteristics etc.

Operating characteristics

hours of use, km-driven etc.

But also

Stock related data

Building cell characteristics

Power generation capacities

Structural characteristics

Industrial production capacities, number of vehicles, etc.

Thermal losses proxy, sqm

Including number of representative units of a typical size

Linking the physical output to products specificities

... IN A FINAL WORD

- POTEnCIA is a new EU energy system model
 - fully operational and validated
 - ... with the 'Central' scenario currently being developed*
- JRC-IDEES forms a key input to the POTEnCIA model
 - ... but can be used well beyond that*
- An interactive and transparent process involving Member States' experts
 - increases the openness and transparency of the tools
 - contributes to capacity building
 - reduces redundant work
- Extending the geographical scope is quite challenging;
 - Work already started for JRC-IDEES
 - Extension of power plant database on-going
 - Gathering of statistical data started

...your input is welcome



Thank you for your attention



JRC Science Hub –POTEnCIA:
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