

# Modeling and Analysis of Energy Systems: matching the Baltic Energy Security Research Platform needs



**Antonio Soria**  
**Head of Unit**

**Economics of Energy, Climate  
Change and Transport**

**Institute for Prospective Technological Studies  
Joint Research Centre  
European Commission**

# Presentation overview



- I. Scientific support from economic modeling**
- II. Baltic region: current situation, what next ?**
- III. A wider picture: energy supply in Europe**
- IV. Increasing energy connectivity: a priority**

# Our capacity in JRC



Provide quantitative assessment of future energy markets under various policy conditions.

Series of economic modeling tools :

- Dynamics of energy demand and supply

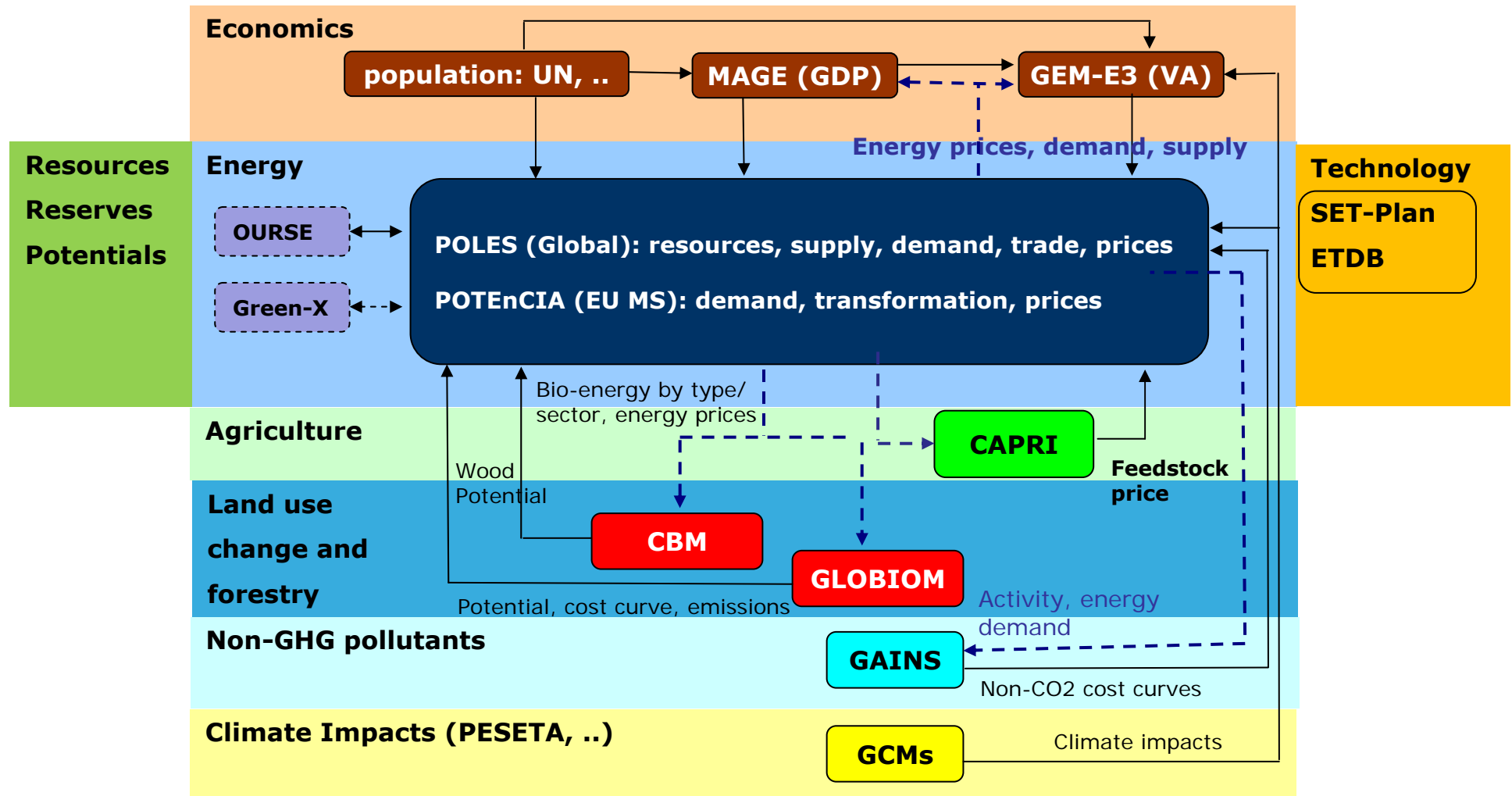
- Economics effects

- National, regional and global scope

- Short to long-term precision

⇒ Appropriate to address the evolution of energy security indicators under different scenarios (the BESRP scope)

# Modeling tools and databases involved



# The energy sector



The JRC is developing and using sector-specific modeling tools:

- Global level : **POLES** - fully operational
  - *World energy system and policies, full energy balances for 57 countries, detailed resources module, international fuel markets, yearly resolution and relying on the most recent data.*
- Member State level: **POTEnCIA** – under development
  - *A dedicated EU-wide energy market modelling tool, decomposed on 28 individual Member States, focusing on the structure of demand, supply, prices, emissions, technological change and energy-efficiency measures.*

# The overall economy: 2 examples



## Scenario

⇒ Technology-specific subsidy to energy production

⇒ Internalization of environmental externalities

## Sector-specific model (POLES, POTEnCIA)

⇒ Increases demand for technology & energy carrier  
⇒ Lower average energy costs and higher demand  
⇒ Positive/negative impact on emissions

⇒ Energy demand decrease  
⇒ Energy mix changes  
⇒ Autonomous energy efficiency improves

## Multi-sectoral model (GEM-E3)

⇒ Improves/worsens trade (depending on the carrier)  
⇒ Substitution between energy and capital/labor  
⇒ Changes in terms of trade of carbon embedding goods  
⇒ Impact on public deficit/consumer prices

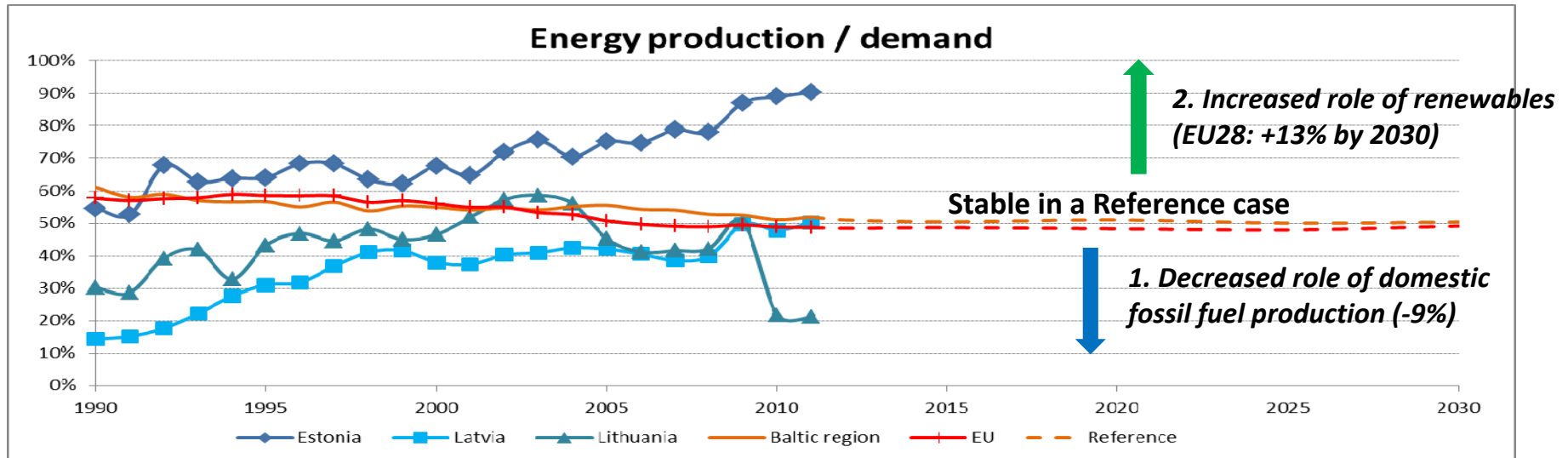
⇒ Consumer welfare changes  
⇒ CBA possible (including investment costs)  
⇒ Shifts in production factor markets

# Presentation overview



- I. Scientific support from economic modeling**
- II. Baltic region: current situation, what next ?**
- III. A wider picture: energy supply in Europe**
- IV. Increasing energy connectivity: a priority**

# Domestic coverage of energy needs



\* Baltic region: Estonia, Latvia, Lithuania, Poland, Finland, Sweden, Germany, Denmark

## Questions:

- What future economic development and related energy needs?
- What role for indigenous resources in supplying these needs?
- Integration of the Baltic region in the EU internal market?
- How does this translate into external energy supply for the EU?

➡ Scenario making for assessment under policy conditions!



# Presentation overview



- I. Scientific support from economic modeling**
- II. Baltic region: current situation, what next ?**
- III. A wider picture: energy supply in Europe**
- IV. Increasing energy connectivity: a priority**

# What future supply for Europe?



EU faces a shortage of "20<sup>th</sup> century" energy resources

The EU is thus setting up policies:

- to develop a highly energy-productive economy
  - ❖ fostering renewables, etc...
- to make the best of domestic energy resources
  - ❖ embracing an ambitious energy efficiency policy

However we will still rely on external suppliers:

- Design a common EU strategy with regards to external supply?
- Implications in terms of political relations?



We need to understand the dynamics of energy system at global and regional levels to anticipate our future position so as to better inform policy making.

The Baltic region is, in this respect, well aware of the issues at stake

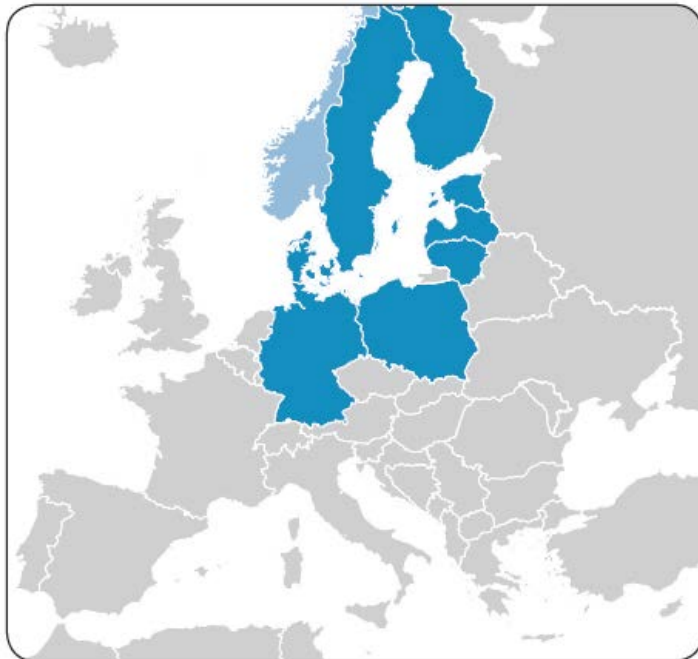


- I. Scientific support from economic modeling**
- II. Baltic region: current situation, what next ?**
- III. A wider picture: energy supply in Europe**
- IV. Increasing energy connectivity: a priority**

# Existing plans



## BEMIP: Baltic Energy Market Interconnection Plan



- electricity

**Projects to be considered as potential PCIs  
(list is not exhaustive)**

LitPol, a new interconnection between Poland and Lithuania

South-West interconnection between Norway<sup>9</sup> and Sweden

New interconnection between Denmark and Germany

Strengthening North-South infrastructure within Finland

- gas

New interconnection between Poland and Lithuania

BalticPipe: Gas interconnection between Denmark and Poland

Interconnection between Norway<sup>11</sup> and Denmark

BalticConnector: Gas interconnection between Finland and Estonia

Regional LNG terminal for the Eastern Baltic region and internal network reinforcements

Interconnection upgrade and reverse flow between Germany and Denmark

# Benefits for Baltic states

## Baltic countries isolated



### Key aspects to consider in the interconnection cost/benefit analysis

- Accurate estimation of the investments required
- Valuing security of supply
- Equalisation of price signals
- A more competitive energy market (gas & electricity): oligopolistic rents decrease
- Clearer, more stable signals for long-term investors
- Synergies in cross-border buffering capabilities to accommodate renewable excess production.
- Macroeconomic impact: production factors market
- Macroeconomic impact: consumer welfare increases



Thanks for your attention

[antonio.soria@ec.europa.eu](mailto:antonio.soria@ec.europa.eu)