

Would climate policy improve the European energy security?

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Climate change mitigation and energy security – Two sides of the same coin?

The Climate and Energy Package and the Energy Roadmap 2050 announce the goals of “reducing greenhouse gases emissions while at the same time ensuring security of energy supply”

- A common root cause - the humanity increasing demand for (fossil) energy
- Solutions imply synergies or trade-offs, e.g.:
 - energy efficiency or renewable technologies promote both goals
 - restricting the uptake of emission-intensive unconventional oil would increase dependence on conventional oil producing regions

→ Investigate (quantitatively assess) the question whether climate policies would improve the European energy security.

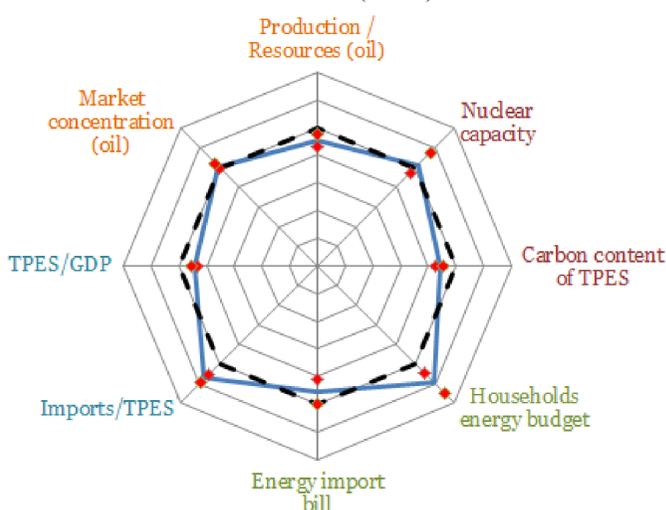
Measuring Energy Security – concepts and indicators

- Tentative definition (by the negative) : Energy insecurity is the risk of welfare impact of either the physical unavailability of energy, or prices that are unaffordable or overly volatile.
- Long-term risks: depletion of fossil fuels, unequal endowment of resources
- A multi-criteria analysis for a many-faceted concept

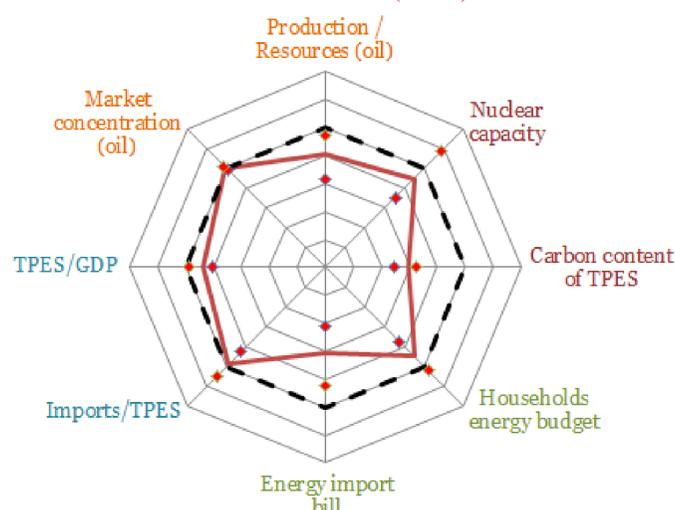
Dimensions of energy security	Selection of indicators
Availability and diversity	- Production/Resources (oil) - Market concentration (oil) (Herfindahl-Hirschmann index)
Dependence	- TPES/GDP - Imports/TPES
Affordability	- Households energy budget (share of revenues) - Energy import bill/GDP
Sustainability and acceptability	- Carbon content of TPES - Installed nuclear capacity

Synergies and trade-offs between climate mitigation and energy security: the time horizon, the indicator and the uncertainties matter

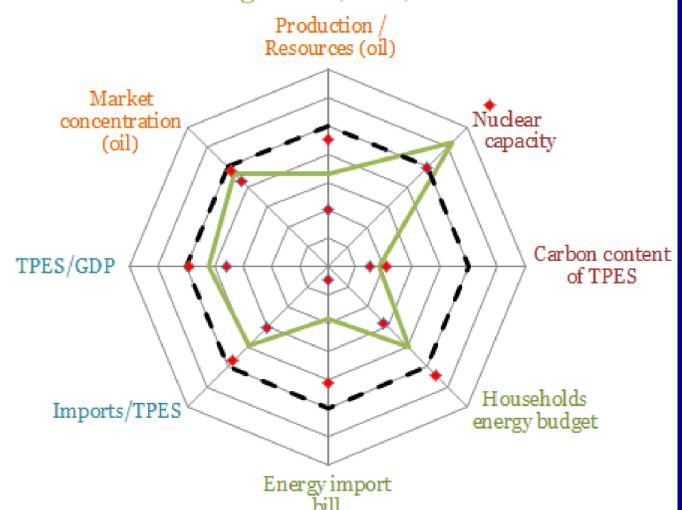
Short-term (2025)



Medium-term (2050)



Long-term (2075)



Ratio between the value of the indicator in a climate policy scenario and its value in the corresponding baseline, **at the same date**.

- Averages over the 96 « alternative future worlds ».
- 5th and 95th percentiles of the results distributions.
- - - - - No change of the value of the indicator between a « baseline » scenario and the corresponding « climate policies » scenario.
- Outside: worsening of the indicator due to climate policies,
- Inside: improvement of the indicator due to climate policies.

Key results:

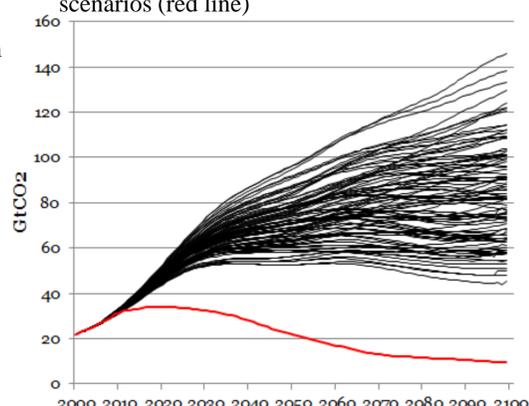
- None of the dimensions of energy security is unambiguously improved by climate policy.
- Some indicators - the ratio of oil production to resources, the energy intensity of GDP and the carbon content of energy - are improved at all three time horizon. This result is robust to uncertainties.
- In the short-term, there are risks of worsening of:
 - The households' energy budget;
 - The share of imports in total energy supply (due to gas imports);
 - The concentration of oil markets;
 - The installed nuclear capacities.
- In the medium term, there are cases of persistent deterioration of those four indicators; but most indicators are improved by climate policy in most scenarios.
- In the long term, most indicators are improved, but with large uncertainty ranges.

Exploring uncertainties with an ensemble of scenarios

An ensemble of scenarios combining hypotheses on model parameters:

- Economic growth drivers (slow, medium or fast productivity growth).
- Availability and costs of low carbon technologies (high or low):
 - Power generation technologies;
 - Carbon capture and storage;
 - End-uses technologies.
- Induced energy efficiency (fast or slow).
- Fossil fuels resources and markets (relatively scarce and expensive or relatively abundant and cheap).

Global emissions in the 96 baseline scenarios (black lines) and mitigation target in policy scenarios (red line)



- 96 (3x2⁵) baseline scenarios
- 96 climate policy scenarios with cap on global CO₂ emissions (~550 ppmCO₂-eq).