Fondazione Eni Enrico Mattei

secure
Security of Energy Considering its Uncertainty, Risks and Economic implications

SEVENTH FRAMEWORK PROGRAMME

SECURE
Security of Energy Considering its Uncertainty, Risk and Economic implications

Andrea Bigano - FEEM

The Freedom House- Budapest

11th September 2008

Introduction: the broad picture

- In the Green paper "A European strategy for competitive, sustainable and secure energy", (2006) the European Commission emphasizes that the EU is facing three issues:
  - climate change mitigation by reducing CO_2 emissions,
  - promoting EU economic competitiveness and competition within the energy sector,
  - and strengthening the safety of energy supplies in a context of increasing import dependency.
- The first two objectives were already mentioned in the 1995 EC White Paper on energy; the emergence of security of supply really appeared as a key concern as from 2000.
- The context has indeed changed, given to
  - the continuous increase of EU energy needs coupled with the increased scarcity of domestic energy resources,
  - the growing competition for access to global energy sources from other consuming regions such as Asia.

Introduction: the broad picture (ctd.)

- The past years have opened a new era of higher geopolitical uncertainty in oil and natural gas, as well as a development of new and complex pricing mechanisms related to competition development in the framework of globalisation and liberalisation processes.

- Moreover, the growing concern about climate change generates both synergies and trade-offs between CO_2 mitigation an energy security policies.

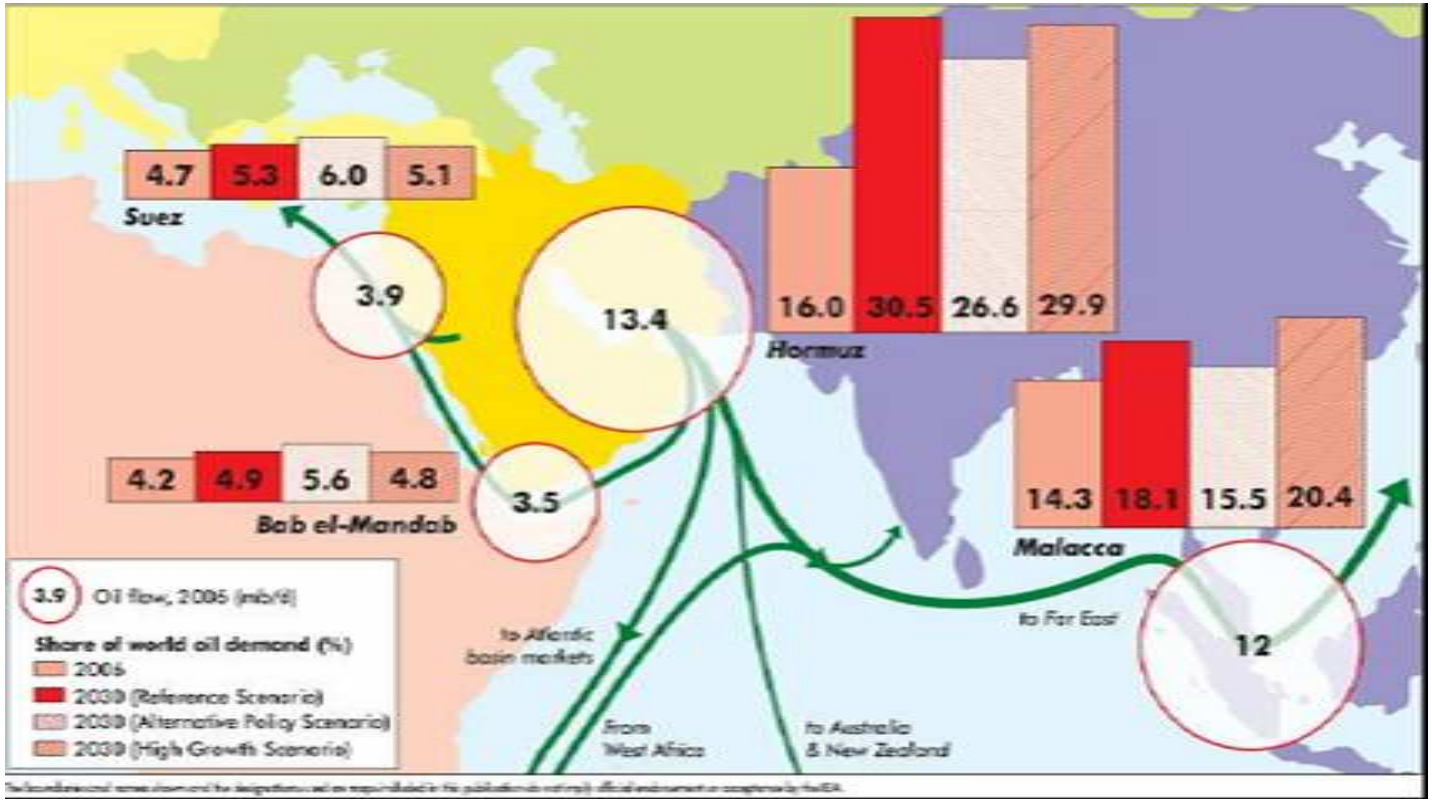
- Fostering the security of energy supplies requires clearly identifying the impact of energy supplies on Europe's economy and the well being of its citizens. Developing tools to reduce uncertainty is, costly; it is therefore of utmost importance to measure the socio-economic benefits of energy security, or the costs of the lack thereof.

Introduction: the broad picture (ctd.)

- The EU domestic energy system is widely considered as not reliable enough to support sustained and stable economic growth over the next decades. OECD European countries' energy consumption is steadily increasing while domestic sources are becoming exhausted, leading to growing import dependence, especially for oil and gas.
- The course of economic development over the next 30 years or so will witness a real challenge nationally and internationally to set policies that address all three core European goals in some compatible or harmonious manner.
- The IEA's 2007 World Energy Outlook predicts that the world's dependence on fossil fuels will continue to increase, at least to 2030. With a continuation of current policies and expected economic growth, energy demand will increase by more than 55 % to 17.7 billion toe by that date, and about 84 % of that will come from fossil fuels (32% from oil).

Introduction: the broad picture (ctd.)

The IEA's 2007 WEO points out that "The consuming countries' growing reliance on oil and gas imports from a small number of producing countries threatens to exacerbate short-term energy-security risks." In particular "r*ising reliance on Middle East oil will increase flows through vulnerable chokepoints – heightening the risk of a supply disruption*



Source: IEA WEO 2007

Aim of the project

- SECURE aims to build a comprehensive framework covering the main issues related to the topic of security of supply, inside and outside the EU. To this purpose it develops tools, methods and models to measure and assess security of energy supply and in particular, EU's vulnerability to various energy supply risks.
- SECURE develops energy security indicators in order to identify the risk factors and quantify the EU exposure to volume and price risks in the short and long terms, including the value consumers give to supply security. Costs and benefits of energy security will be evaluated for different energy demand scenarios to help policy makers providing the most appropriate institutional, political and industrial solutions.
- All major energy sectors are addressed from upstream to downstream with both a global and sectoral analysis. The analysis integrates also demand issues related to energy security.
- The expected output of SECURE include a comprehensive methodological and quantitative framework to measure energy security of supply,energy security scenarios to 2030, and policy recommendations on how to improve energy security taking into account costs, benefits and risks of various policy choices.
- Our results may help designing EU's energy insecurity mitigation strategies.

SECURE's key features

- Interdisciplinary approach
- Innovative methodology
- Multi- dimensional and multi- sectoral approach
- Quantitative tools (models and indicators)
- Value of energy for the consumers
- Policy focus
- Multicriteria analysis
- Stakeholder involvement inside and outside the EU

SECURE's main figures

- 16 partners
- 3.77 million € budget
- 3 years
- 10 countries (8 EU +Switzerland and Russia)
- 79 deliverables (61 of which scientific)
- 9 dissemination events (3 of which in energy supplying countries outside EU)

The partnership

Partner	Acronym	Country
Observatoire Méditerranéen de l'Energie	OME	France
Fondazione Eni Enrico Mattei	FEEM	Italy
Ramboll Oil & Gas	RAMBOLL	Denmark
Lietuvos Energetikos Institutas	LEI	Lithuania
Fraunhofer- Institute	Fraunhofer	Germany
Joint Research Centre	JRC	Belgium
Technische Universität Dresden	TUD	Germany
Paul Scherrer Institut	PSI	Switzerland
CESI RICERCA S,p.A.	CESI-RI	Italy
Energy Research Institute Russian Academy of Sciences	ERI RAS	Russian Federation
The University of Bath	Bath	United Kingdom
Gulf Research Center Foundation	GRCF	Switzerland
Centre for European Policy Studies	CEPS	Belgium
Vienna University of Technology, Energy Economics Group	TU-WIEN	Austria
Centre National de la Recherche Scientifique	CNRS	France

Interdisciplinary approach

SECURE considers the following categories of energy security threats:

- Geopolitical: the consequences of the concentration of reserves within a few regions, but also the exposure of energy producing and transit regions to political instability and terrorist threats.
- Technological: intrinsic risks posed by the design current technologies - limits to the potential of technological progress. Physical disruptions of supply occur when an energy source is exhausted; or production is stopped, or the logistics chain interrupted, with a temporary or permanent horizon.

Interdisciplinary approach (ctd)

- Environmental: there are many environmental concerns about damage to the ecosystems caused by the energy chain, whether accidentally (oil slicks, nuclear accidents, methane leaks) or as a result of polluting emissions (urban pollution and greenhouse gas emissions). Catastrophic accidents may cut supplies, but also the mere threat can reduce acceptability of energy infrastructures.

- Economic/Regulatory: bottlenecks caused by lack of regulatory coordination, the role of the real energy policy decision makers, etc. Economic disruptions are caused by erratic fluctuations in the price of energy products on markets. Price variations can be due to supply/demand actual or anticipated imbalances. Thy can also result from speculative movements and market power abuse. In any case, market design and regulation are at stake as far as prices are concerned.

Innovative methodology

- The state of the art in the field of security of supply is dominated by a lack of precision and quantification. A substantial methodological effort is needed.
- A common, shared approach is still lacking in the literature about security of supply. Many indicators have been proposed and even though some appear to feature a number of desirable properties (*in primis* the Shannon-Wiener index), many variants are possible and a number of alternative indicators retain their merits. There is wide scope for improvement and generalization
- Improvements will entail
  - defining energy security of supply
  - including risk and uncertainty more organically than before into the analysis
  - defining a common methodological approach for which is
    - analytically rigorous;
    - allows quantitative treatment of research issues as much as possible;
    - allows inclusion of non–quantitative components;
    - maximises synergies within the project.

Dimensions and sectors

- Short term vs Long term security
- External vs internal energy security
- Sectoral analysis and global scenarios

Short term unforeseen supply disruptions, price swings, blackouts;
Long term : structural supply shortages, cut-off of regional supplies due to long term regional crises, etc.

External energy insecurity: energy imports related elements such as geopolitical issues, international transit, upstream technical issues in non EU countries, etc.
Internal energy insecurity: uncertainty related to European energy demand, infrastructure, energy policy orientations and institutional developments. Market risks in the framework of liberalisation, either due to bottlenecks, market power or regulation, etc.

Sectors:
- Oil,
- Natural gas,
- Coal,
- Nuclear,
- Renewable sources
- Electricity
- Demand management

Quantitative tools

- The project relies on a number of state-of the art quantitative models for its quantitative analysis. More than one model is needed due to the specificities of energy sectors. Models include:
- POLES (global energy scenarios simulation model)
- ERA (Energy Risk Assessment)
- GASMOD (EU natural gas supply model)
- Ramboll Oil&Gas security of natural gas supply model
- Green-X (renewable enrgy sources model)
- DISPAEREA (energy/power dispatch by areas electricity model)

Value of energy security for consumers

- Identifying the means that citizens are willing to put in risk coverage is useful for determining energy security policies. SECURE derives estimates for the willingness to pay in order to avoid energy insecurity from both households and industry, using a survey-based approach.

- Our approach allows us to ask the survey respondent questions specific to a range of different sources and types of energy insecurity. The goal is to get evidence on expenditures on energy security measures made by households and industry groups as well as the value placed on reductions in energy security risks by these agents.

- Advantages:
  - clarify priorities for final users
  - provide key quantitative information
  - improve the design of policy responses.

Project structure

WP8. Scientific coordination

WP9. Administrative management

WP1. Methodological developments
Definition of concepts and general methodology of the project

WP2. Value of energy security
Estimation of consumers' risk aversion and willingness to pay for security

WP3. Long term policy lines
Qualitative analysis of energy policy options and scenarios for the EU

WP4. Quantitative global models
- Long term energy scenarios based on policy lines
- Adaptation of the POLES model to include risk assessment
- Development of energy risks assessment model (ERA)
- Quantitative analysis of policy recommendations

WP5. Models and tools by energy source

5.1. Oil

5.2. Natural gas

5.3. Coal

5.4. Nuclear

5.5. Renewable energy sources

5.6. Electricity

- External supply
- Internal supply

- Geopolitical risks
- Technical risks
- Economic & regulatory risks

5.7. Impact of accidents and terrorist threats

5.8. Demand dimension of energy security

WP6. Results and policy recommendations

WP7. Stakeholders consultations and dissemination

Thanks for your attention!

andrea.bigano@feem.it

Fondazione Eni Enrico Mattei

corso Magenta 63
20123 Milano - Italy

tel **+39 | 02 | 5203.6975**
fax **+39 | 02 | 5203.6946**
web **http://www.feem.it**

secure
Security of Energy Considering its Uncertainty, Risks and Economic implications

SEVENTH FRAMEWORK PROGRAMME