RECONCILING CLIMATE POLICY AND ENERGY SECURITY

MAIN RESULTS AND RECOMMENDATIONS FOR THE EU FROM THE SECURE PROJECT

FEEM-IEFE Joint Seminar - Thursday 14 April 2011 - h. 12.00

Milan: FEEM, Sala Consiglio
Venice: FEEM, Sala Riunioni (videoconference)

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Fondazione Eni Enrico Mattei

The SECURE Project

Security of Energy Considering its Uncertainty, Risk and Economic implications

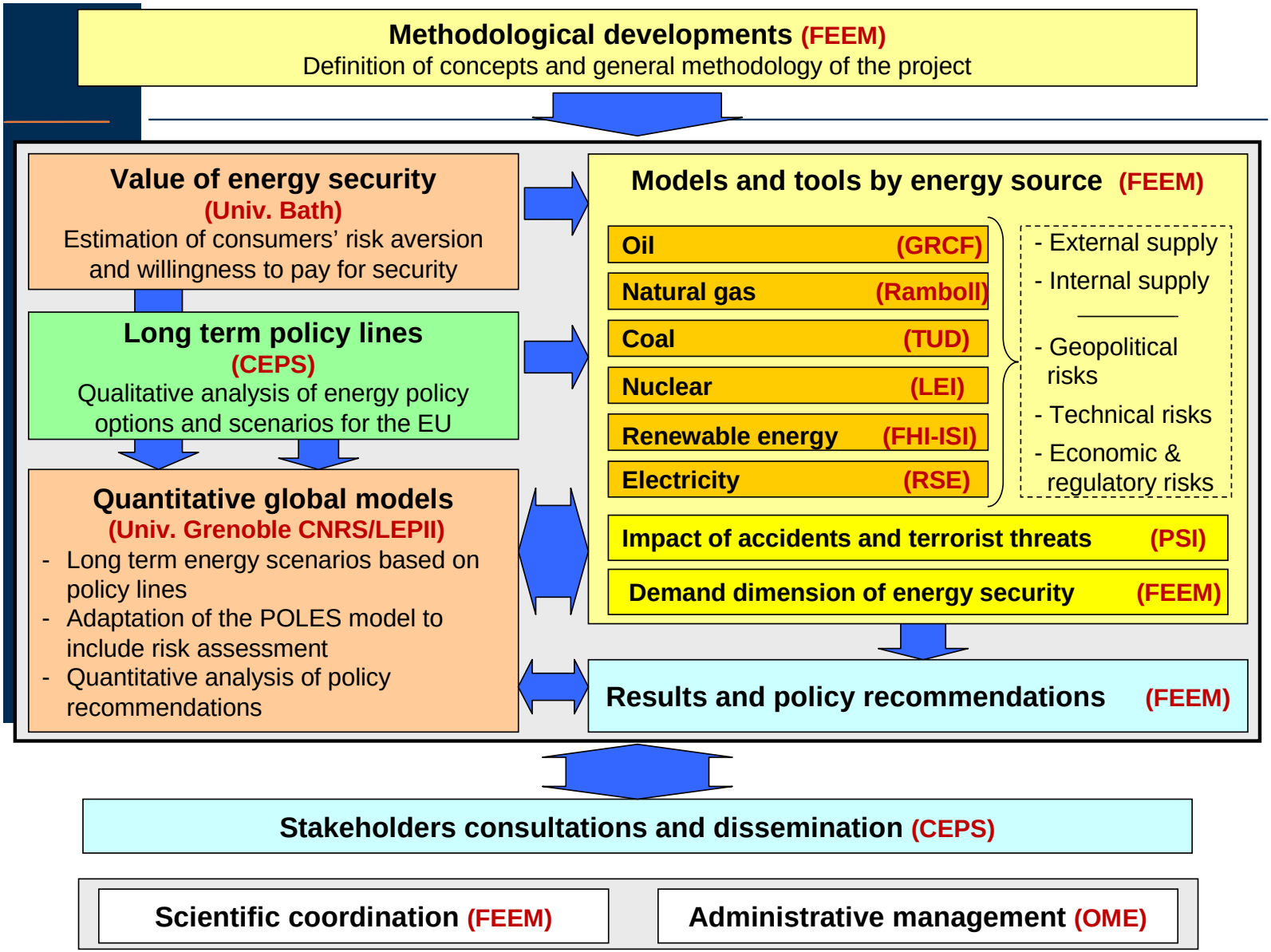
- **Comprehensive framework** of major issues related to energy security including **geopolitics, economic/regulatory and technical** design of energy markets **both inside and outside the EU**
- Analysis of **all major energy sources and technologies** (*oil, natural gas, coal, nuclear, renewable and electricity*) from upstream to downstream (*supply and demand side approach*)
- **Development of tools, methods and models** (global and sectoral) to measure and assess security of supply
- **Policy recommendations** on how to improve energy security taking into account costs, benefits and risks of various policy choices

Duration: 3 years (36 months: January 2008 - December 2010)
Co-financed by the European Commission FP-7 programme

FONDAZIONE ENI ENRICO MATTEI

SECURE Project partners:
15 leading and prestigious European research institutions

	Partner		Country
Coordinator	Observatoire Méditerranéen de l'Energie	OME	France
Scientific Coordinator	Fondazione Eni Enrico Mattei	FEEM	Italy
	Ramboll Oil & Gas	RAMBOLL	Denmark
	Lietuvos Energetikos Institutas	LEI	Lithuania
	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.	Fraunhofer	Germany
	Joint Research Centre	JRC	Belgium
	Technische Universität Dresden	TUD	Germany
	Paul Scherrer Institut	PSI	Switzerland
	Ricerca sul Sistema Energetico	RSE	Italy
	Energy Research Institute Russian Academy of Sciences	ERI RAS	Russian Federation
	The University of Bath	Bath	U.K.
	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


Methodological developments (FEEM)
Definition of concepts and general methodology of the project
Value of energy security
(Univ. Bath)
Estimation of consumers' risk aversion and willingness to pay for security
Long term policy lines
(CEPS)
Qualitative analysis of energy policy options and scenarios for the EU
Quantitative global models
(Univ. Grenoble CNRS/LEPII)
- Long term energy scenarios based on policy lines
- Adaptation of the POLES model to include risk assessment
- Quantitative analysis of policy recommendations
Models and tools by energy source (FEEM)
Oil (GRCF)
Natural gas (Ramboll)
Coal (TUD)
Nuclear (LEI)
Renewable energy (FHI-ISI)
Electricity (RSE)
- External supply
- Internal supply
- Geopolitical risks
- Technical risks
- Economic & regulatory risks
Impact of accidents and terrorist threats (PSI)
Demand dimension of energy security (FEEM)
Results and policy recommendations (FEEM)
Stakeholders consultations and dissemination (CEPS)
Scientific coordination (FEEM)
Administrative management (OME)

Intensive Stakeholder Consultations and Dissemination

Timing	Workshop (WS)	Location	Organizer
29 Jan 09	Thematic WS: Methodology and scenarios	Brussels	CEPS
26 Nov 09	Thematic WS: oil, gas, coal	Paris	OME
18-19 Jan 2010	Thematic WS: Nuclear, Renewables, Electricity, Accidents & Terrorism, Demand, Value)	Milan (2 days)	ERSE
29 Sept 2010	Workshop Results & Policy Recommendations	Brussels	CEPS
2 July 2010	Regional WS "Russia & CIS"	Moscow	ERI RAS
19 Oct 2010	Regional WS "North Africa"	Cairo	OME
9-10 Nov 2010	Regional WS "Gulf"	Bahrain (2 days)	GRCF
16 Nov 2010	Policy event with the European Parliament	Brussels	CEPS
25 Nov 2010	Final Conference	Brussels	CEPS

- SECURE SCENARIOS

Energy and climate: two « bathtub problems »

- Between now and 2050, humanity have to face a double problem:
  - The growing scarcity of oil (… and gas, but not of coal !)
  - The accumulation of GHGs in the atmosphere
- These « bathtub problems » cannot be considered independently as:
  - Hydrocarbon scarcity paves the way to coal
  - Conversely, climate policies open the path to low carbon societies
- **“Smart energy policies” should combine the security and sustainability dimensions**

SECURE:
5 scenarios + 3 sensitivity studies with the POLES model

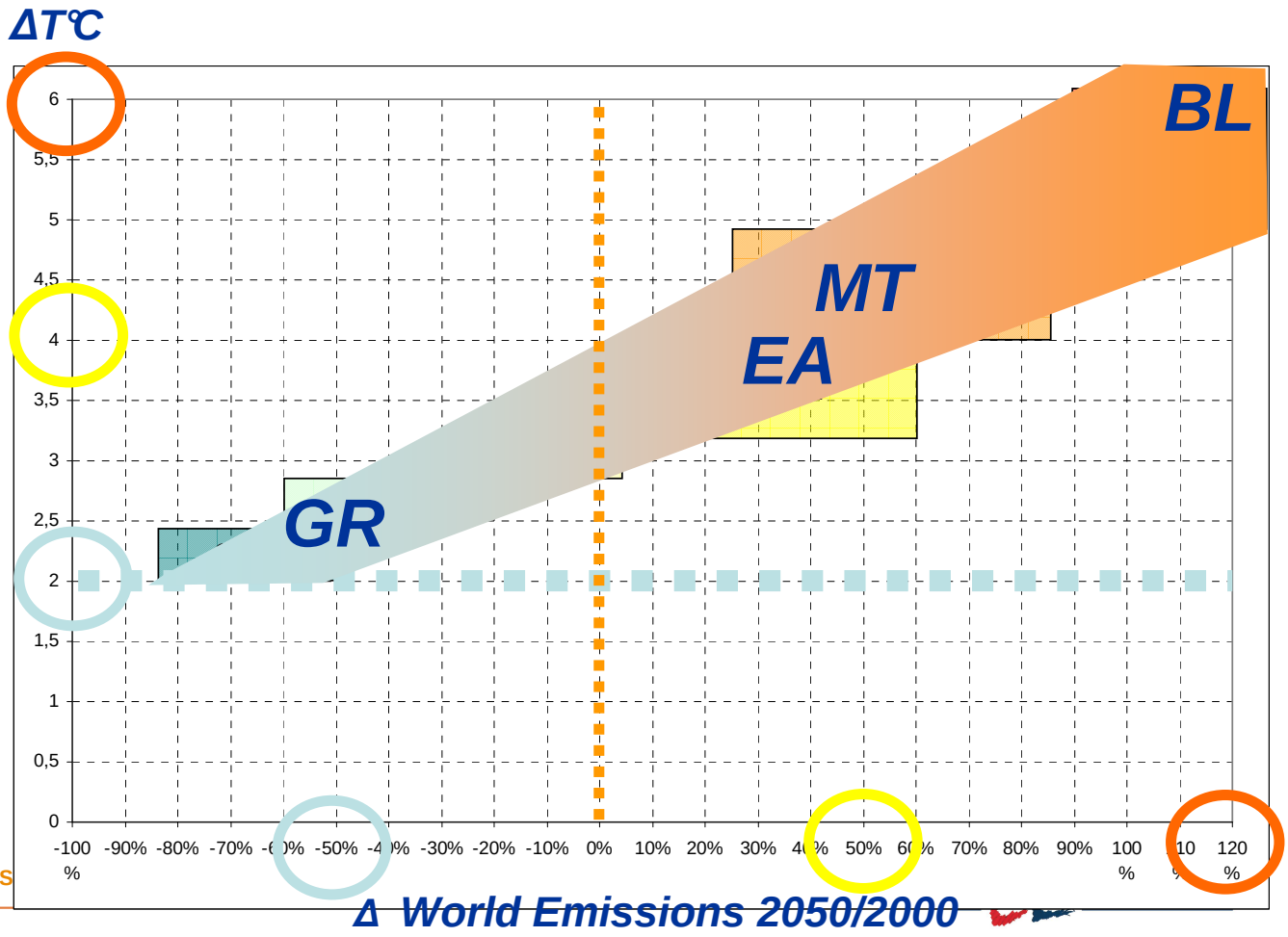
➢ Scenarios

1. The ***BaseLine*** **case is a counter-factual, no climate policy scenario, used mostly for benchmarking**
2. The ***Muddling Through*** **scenario describes the consequences of non-coordinated, low profile climate policies**
3. The ***Muddling Through & Europe Plus*** **case represents the same settings but with a stronger effort in Europe**
4. The ***Europe Alone*** **case represents the outcome of a scenario in which only the European Union commits to strong targets (-80%)**
5. The ***Global Regime*** **explores a new world energy system, under strong emission constraint, consistent with the 2℃ target**

➢ Sensitivity studies and shocks

1. **Oil and gas shocks**
2. **Nuclear accident + phase out**
3. **Problems in the diffusion of the CCS**

SECURE scenarios and IPCC AR4 categories



SECURE scenarios, hypotheses and outcomes

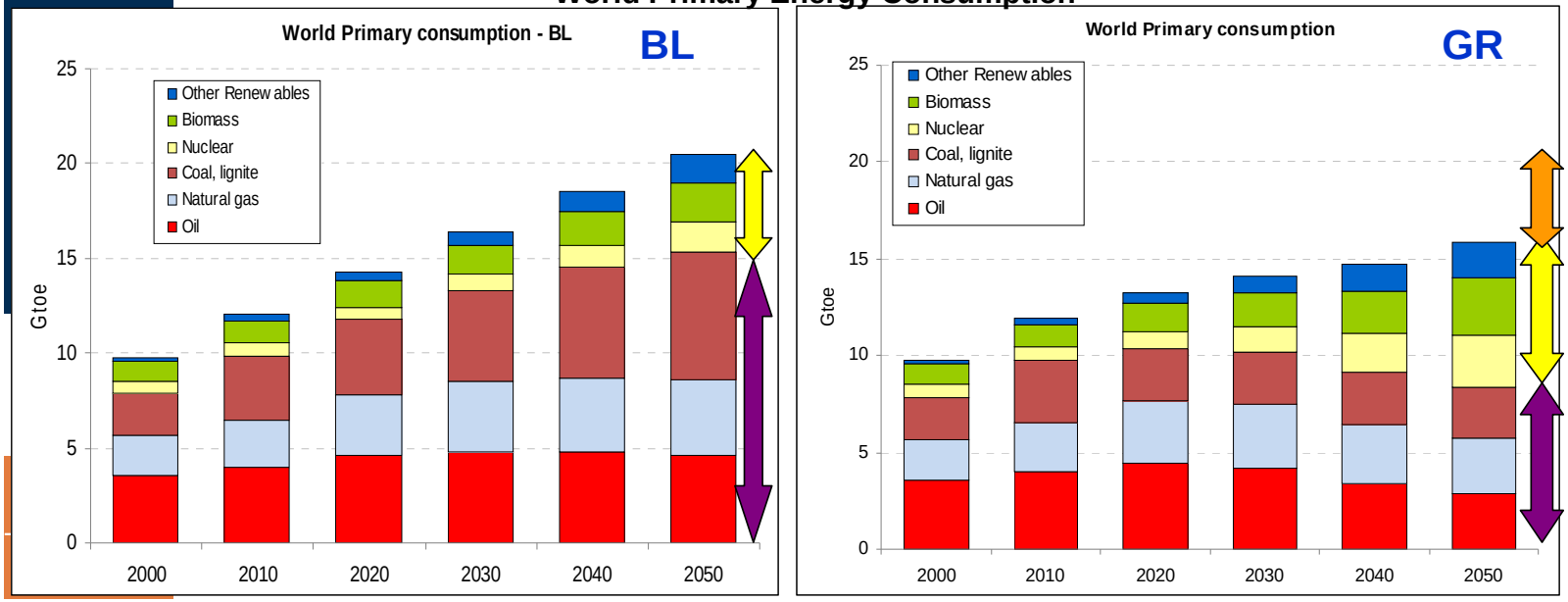
	Carbon Price 2050 (€/tCO2)	Emissions 2050 / 1990	AR4 categories
Baseline	0	134%	Type VI (5-6℃) 700 CO2
Muddling Through	40 in Eur 32 in RoW	72% (EU: -21%)	Type IV (3-4℃) 500 CO2
MT E+	89 in Eur 32 in RoW	67% (EU: -40%)	Type IV (3-4℃) 500^{-} CO2
Europe Alone	185 in Eur 32 in RoW	59% (EU: -60%)	Type IV (3-4℃) 500^{-} CO2
Global Regime	392 in A1 257 in NA1	(2050/2000) -50% (Annex 1: -80%)	Type II (2-3℃) 400 CO2

From the Baseline to the Global Regime case

- In the Baseline case, World energy consumption and CO2 emissions double by 2050: this is not sustainable neither from the climate perspective nor from the resource availability perspective
- The Global Regime induces a fully different picture with lower total consumption and a much higher share of non fossil (≈50%)

Source: Poles

World Primary Energy Consumption

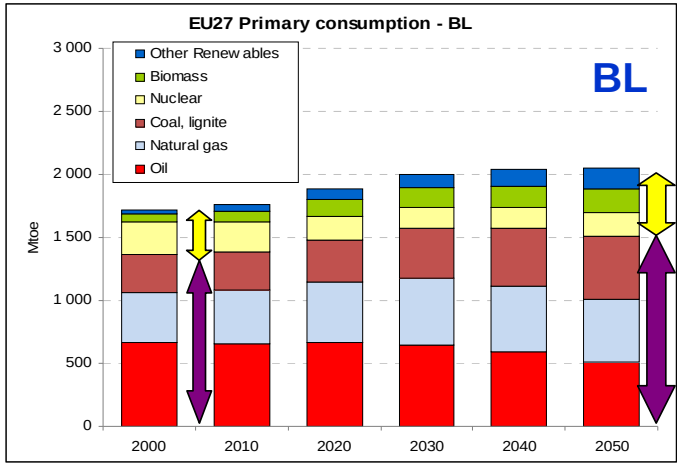


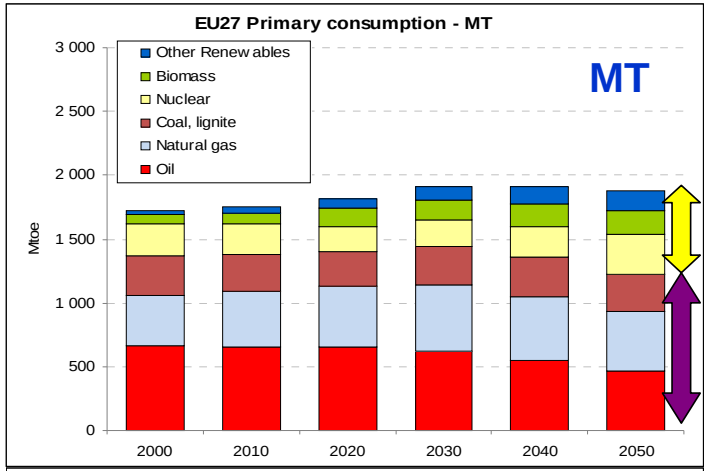
Global outcomes of the SECURE scenarios

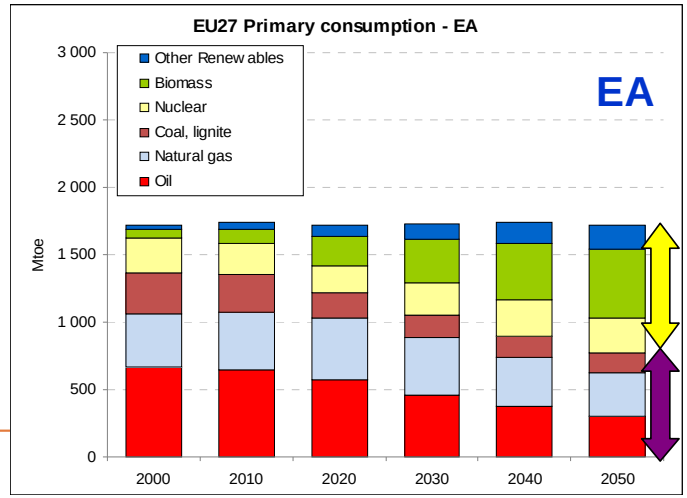
- The ***Muddling Through*** implies:
  - a significant increase in emissions in 2050 (+ 40%, + 4-5℃)
  - very high production levels for oil and gas with risks of crises
- The ***Europe Alone*** case somehow alleviate tensions, but it will not solve the twin energy and environment problems
- Only the ***Global Regime*** case can bring a sustainable energy system to 2050:
  - an emission profile that is (almost) compatible with the 2℃ target
  - lower energy prices (60 $/b, instead of more than 100 $/b)

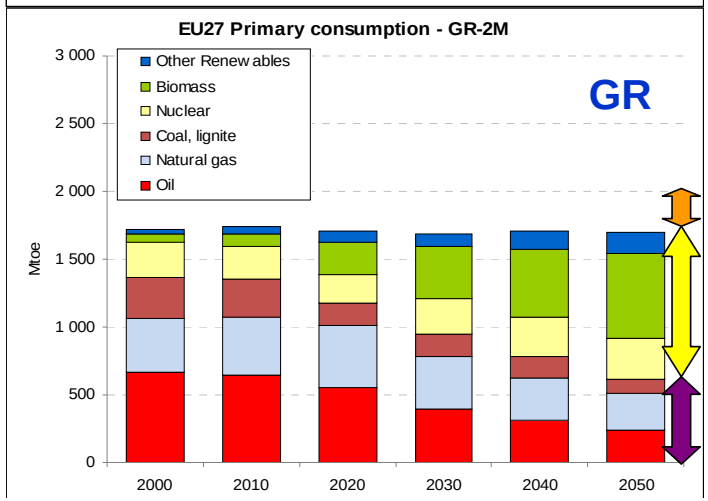
EU-27 primary mix by scenario

- In the Global Regime EU total demand is 20% lower in 2050 than in the Baseline
- And non fossil sources represent almost two thirds of supply, compared to only one fourth in the baseline





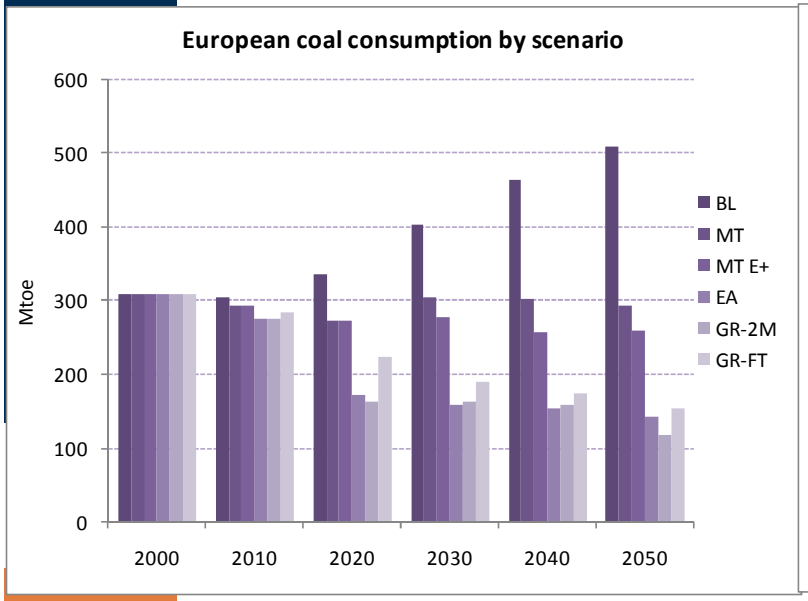


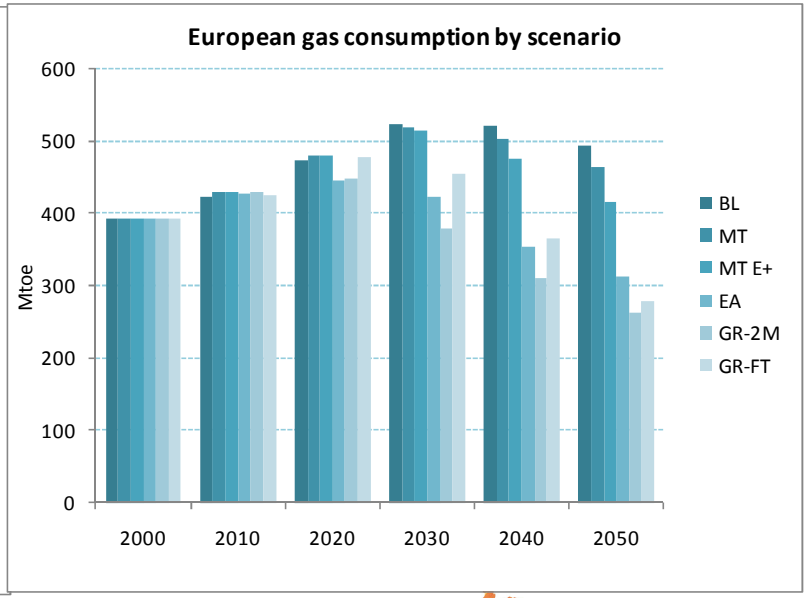


Source: Poles

Europe's coal and natural gas consumption

- Natural gas, as a non CO_2 intensive fossil is much less impacted by climate policies than coal
- Total 2020 gas supply decreases only from 480 to 450 Bcm between the two extreme cases, however in 2050 it decreases from 500 to 265 Bcm

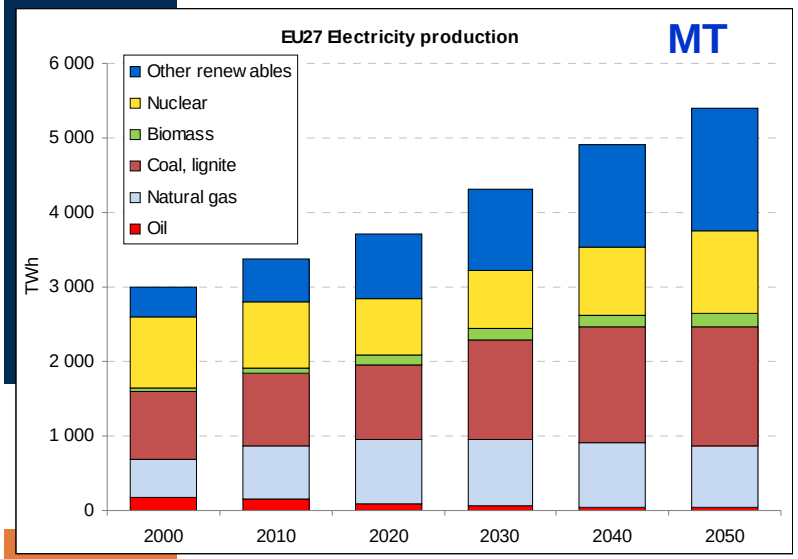


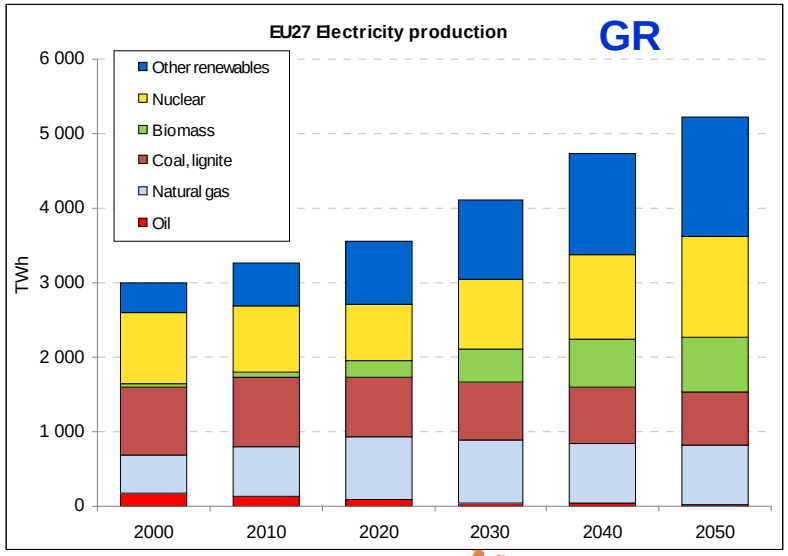


Source: Poles

European ELECTRICITY production by source

- **A strong carbon constraint implies**
  - **more renewables and nuclear**
  - **substitution of coal-based by biomass-based generation**
  - **CCS development (on coal, gas and biomass)**
  - **natural gas power generation is hardly impacted**





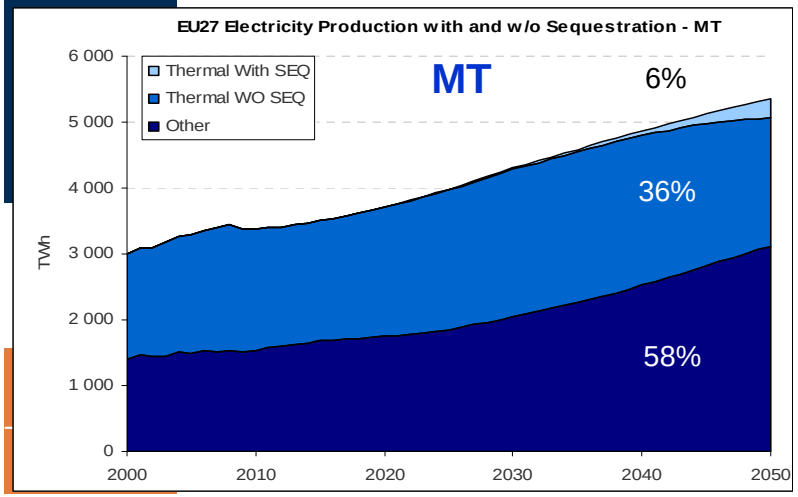
Source: Poles

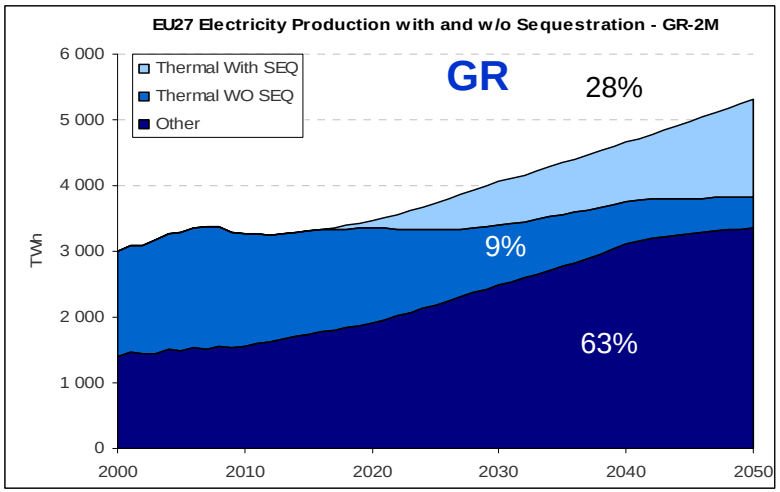
European electricity production: CCS

- **Total electricity is not impacted as it is a major carrier of decarbonisation**
- **However the share of thermal production without CCS decreases dramatically when the emission constraint is reinforced**
  - **The share of non fossil production increases sooner in the global regime case**
  - **… and thermal production with CCS increases dramatically just after 2020, when the emission constraint is reinforced**

This poses the problem of the industrial capability of industry to bring in CCS at such a high speed

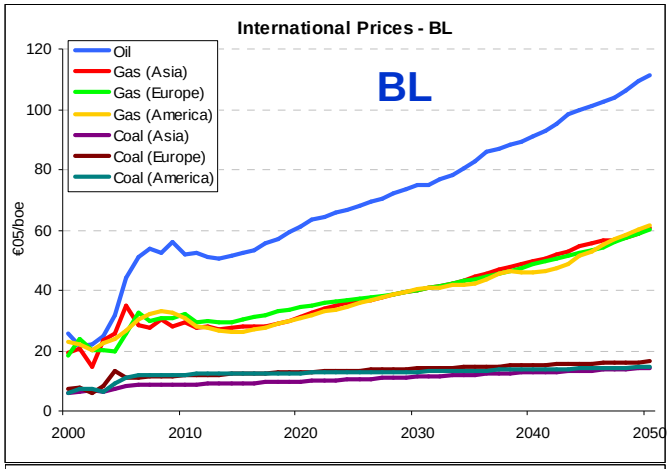
Source: Poles

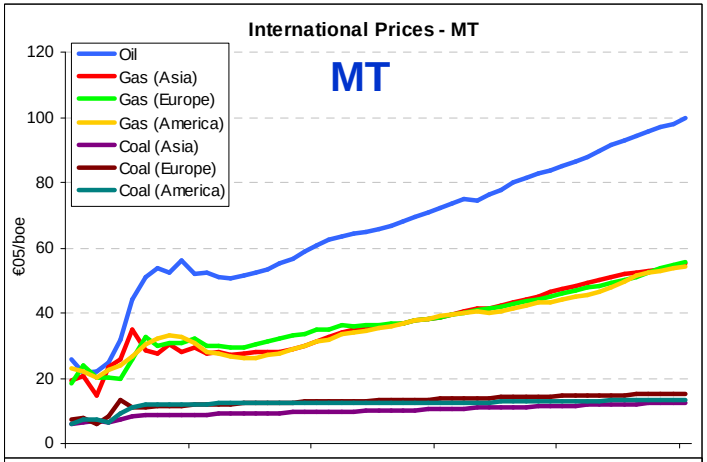


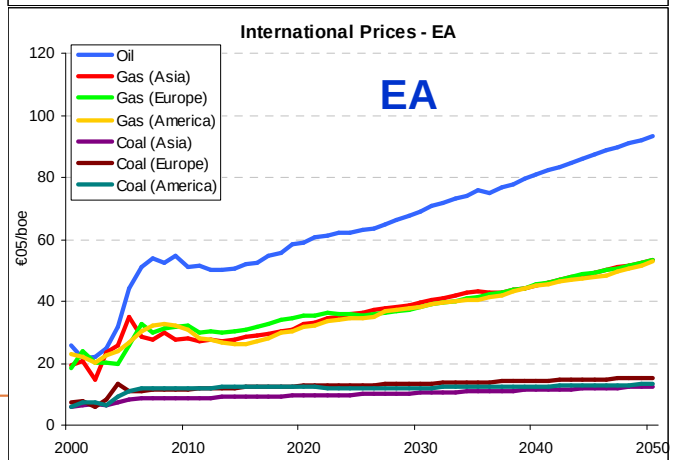


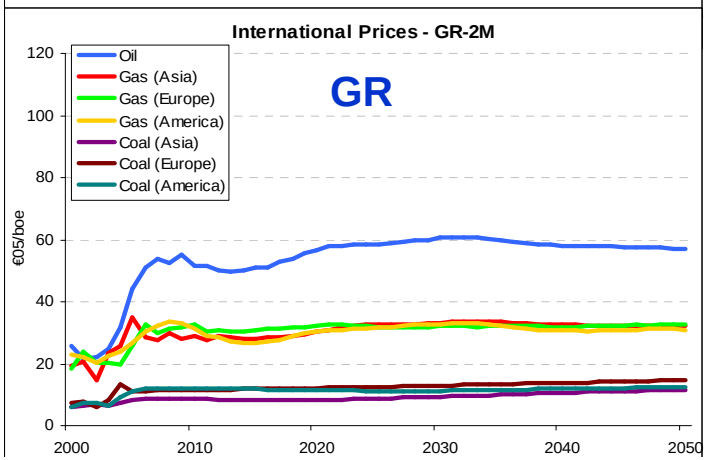
International energy prices

- In 2050, international oil and gas prices are about twice lower in the Global Regime than in the Baseline
- GR: the market is much less tense and the risks of price shocks is much lower than in the Baseline









Source: Poles

Security of supply risks and climate-energy policies

$Risk_{c/e}$ =	$Probability_e$	x $Magnitude_e$	x $Vulnerability_{c/e}$
Muddling Through	**High**	**High**	**High**
Europe Alone	**High**	**High**	**Low**
Global Regime	**Low**	**Low**	**Low**

- European climate policies may bring a double dividend in terms of reduced vulnerability to energy shocks, even in a non-cooperative framework
- The counterpart is the risk of loss of competitiveness

Conclusions: consequences for cooperation

- **The SECURE scenarios illustrate that strong climate policies may also alleviate the Security of Supply problem of Europe**
- **But the implementation of these policies, although probably desirable from the long term perspective, is uncertain both in its principle and intensity**
- **This creates a serious Security of Demand problem for the investments of exporting countries or regions**
- **The challenge is to explore the economic and institutional conditions that may allow for an even development of energy supply investments, while taking into account the interests of both sides**

Conclusions (2): other issues

1) Across the different scenarios total electricity consumption remains strong as it is the main carrier of decarbonisation

- The power generation technology mix changes a lot with more renewables, nuclear and CCS, but natural gas is little impacted
- But many issues should be kept in mind, in particular the institutional dimension. A need for a:
  - **Higher degree of integration of the European electricity and gas systems**
  - **Framework and incentives for electricity investment, including for renewable and nuclear development**
  - **Framework and incentives in new technology chains (scaling-up of CCS)**

2) Scenarios produced with models provide consistent images of the future under different policy settings and they explore their consequences and feasibility conditions

- but do not allow for the taking into account of **geopolitical disruptions** or of **chronic market instabilities**

- OIL

Potential threats to oil security

- Resource Nationalism
- Political Instability
- Export restrictions
- Armed conflict:
  - Interstate War
  - Civil (Intrastate) Wars
  - Violent Non-State Actors
- Maritime logistics

Oil and Gas - geopolitics

Conclusions on Resource Nationalism and Political Instability

- The discussion and analysis conducted in the project has shown that there is **no easy and immediate connection between resource nationalism and/or political instability, and global supply of oil and gas**.
- This is not because political developments are irrelevant for influencing oil and gas supplies, but because this influence is highly variable and unpredictable.
- **Political instability and resource nationalism have been shown to have rarely been associated to acute supply crises or shortfalls**. Their effect is rather gradual and normally compensated by action in other parts of the system.

Oil and Gas - geopolitics

Conclusions on Resource Nationalism

- Financial instability, negative returns on financial assets and protectionism against the oil producing countries' industrial exports all contribute to supporting the view that it is best to keep oil and/or gas in the ground.
- **Also, the adoption of EU aggressive policies aimed at decarbonisation, and if these policies are then not implemented, may have a counterproductive effect in terms of security of supply**
  - Policy Indication for the EU: **Do not entertain policy objectives which cannot realistically be reached, and emphasise cooperation and pragmatism rather then confrontation and maximalism**

Conclusions on Armed Conflicts

- **Oil and gas installations appear to be much more resilient to armed conflict than is normally acknowledged**
  - Interstate wars are a low-probability event; they are generally confined to two main belligerents and contained
  - Civil wars or violent action on the part of non-state actors are phenomena whose frequency has not diminished at the global level
- **Civil wars cause only little damage to energy installations but hinder investments**

Policy recommendation:

- **Encourage producers to invest in reserve (unused) capacity, and secondarily, to maintain stocks.**

Oil shipping – restrictions of passage

- The most dramatic situation for World oil supply would be the closure of the Strait of Hormuz.
  - This is not easily accomplished.
  - A good part of Gulf oil could be sent from other ports of the region.
  - Recommendation:
    - maintain readiness to reorient oil flows as necessary.
    - Maintain the military capability to reopen the Strait of Hormuz in the unlikely event that it might effectively be closed
- The EU should aim at mitigating the danger of closure of other critical sea lanes which might be caused by navigation accidents through congested passages (Bosphorus, Danish Straits).
  - Turkish Straits:
    - An option would be to seek revision of the Montreux convention of 1936, to allow the imposition of size limitations and passage charges on tankers, to discourage free riding and create conditions for the commercial development of pipeline by-passes.
    - Maritime logistics are unlikely to generate major crises, but require constant attention
- The EU should aim at facilitating investment in infrastructure adapted to reduce the danger of accidents and vulnerability, by offering financial incentives and promoting even more stringent regulations for oil and chemical tankers

Volatile and unpredictable OIL PRICES

- Energy security is primarily a function of investment
- Investment in a market economy is a function of the expected revenue stream, which in turn is a function of prices
- A well-functioning market is therefore a key component of security
- The main obstacle to oil and gas security of supply is the growing volatility of prices and their fundamental unpredictability
- Security itself is also dependent on prices. Customers feel secure if they can buy all the energy they need at prices that they can afford
- The root cause of price volatility is the rigidity of demand and supply in the short term. These are impossible to change and can only be alleviated through:
  - Encouraging the accumulation of larger stocks
  - Increasing the relative weight of trading in real “wet” oil barrels rather than future paper contracts and their multiple derivatives.

OIL:

Enhance storage opportunities

- **Increase oil storage capacity in proximity to market and establish an oil lending window**
- **The EU should establish a public agency to invest in large storage facilities to be offered for use to oil producers (NOCs, IOCs) at low cost.**
  - **The Agency should be empowered to issue certificates convertible in physical barrels.**
  - **Certificates should be designed in such a way that they will be accepted as collaterals by financial institutions.**
  - **The availability of an "Oil Bank" of this kind, would encourage investment in capacity additions in anticipation of demand, thus contributing to more comfortable supply conditions.**
- **Rationale:**
  - **producers would be encouraged to produce a bit more and store, and to invest in capacity increases**
  - **Oil stored is more secure than oil in the ground**
- **Japan has set the example**
- **Storage to be built at major loading points – reinforces proposal for crude oil exchanges**

OIL: Enforce an internationally agreed price band

- In a context in which oil is a source of oil revenue for both sides, mutual revenue guarantees are possible and would strengthen the credibility of the band
- **Governments of producing and consuming countries would exchange a collar,** whereby
  - **if prices go above the upper strike producers transfer revenue to consumers, and**
  - **if price goes below the lower strike, consumers transfer revenue to producers**

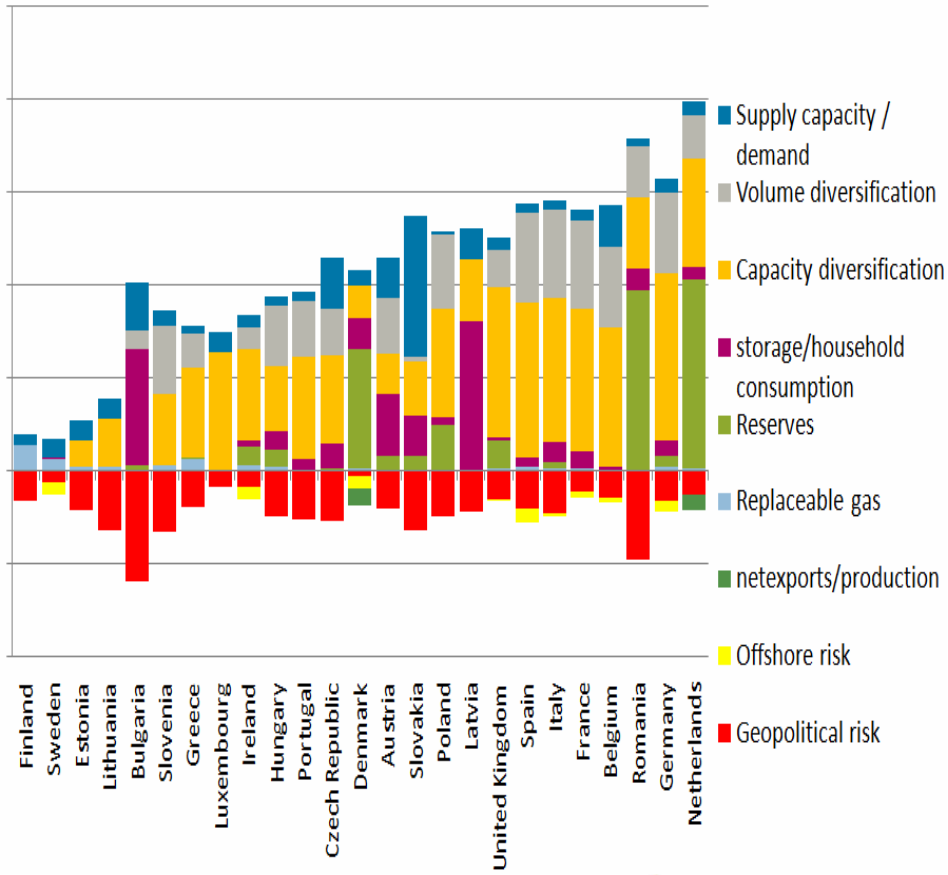
Conclusions on OIL

- Encourage the freer trading of major crude oil streams, notably those from the Gulf and Russia;
- Increase reliance on long term pricing;
- Enforce an internationally agreed price band;
- Increase oil storage capacity in proximity to market and establish an oil lending window;
- Encourage vertical integration.

- GAS

Natural Gas

- **Natural gas security is not only a question of the external dimension such as diversification of supply sources and routes. Demand side and internal factors are as important.**
- Many parameters are at play – and these parameters can change over time e.g. as the consequence of policy.
- Thus securing supply is a mix of measures and forward looking policies.



Source: Ramboll Secure SoS index

GAS:

Over the last three years European GAS markets have profoundly changed

- Economic recession => gas demand in 2009: -6%
- Unprecedented increase in global LNG supply
- Mass production of unconventional gas in the US
- Collapse in the spot gas market
- Market decoupling spot / oil-indexed
- Major Ukraine-Russia gas crises in January 2009
  (lesson learned: the internal market did not function)
- 4 B€ EU Stimulus package for the Energy sector:
  - More than half goes to EU gas and electricity interconnections to increase the physical functionning of the internal market and thus improve security of supply.
  - It also addresses sustainable development by giving support to offshore wind and for carbon capture and storage.
- New EU natural gas security of supply regulation adopted

GAS:

Internal market needs to be further strenghtened

This will be beneficial for SoS

Allow the gas to go where it is needed, when it is needed

- Systematic reverse flow and removal of bottlenecks
- Storage access
- Increased production
- Alternative imports (pipeline and LNG)
- Market concentration

- National and regional differences imply that SoS mitigation tools will differ between countries
- Special effort is needed for the Balkan and the Baltic countries

GAS:

Security of Supply /Security of Demand : two sides of the same coin

- Importers require Security of Supply
- Exporters require security of Demand (on which to base on their investments)

- EU should provide clearer signals regarding future gas demand in Europe to facilitte investment both internally and externally
- Underinvestment may threaten EU's long term security of supply
- The EU should develop a gas demand forecast which is an amalgamation of energy policies and individual national plans

GAS:

Other SoS recommendations for Europe

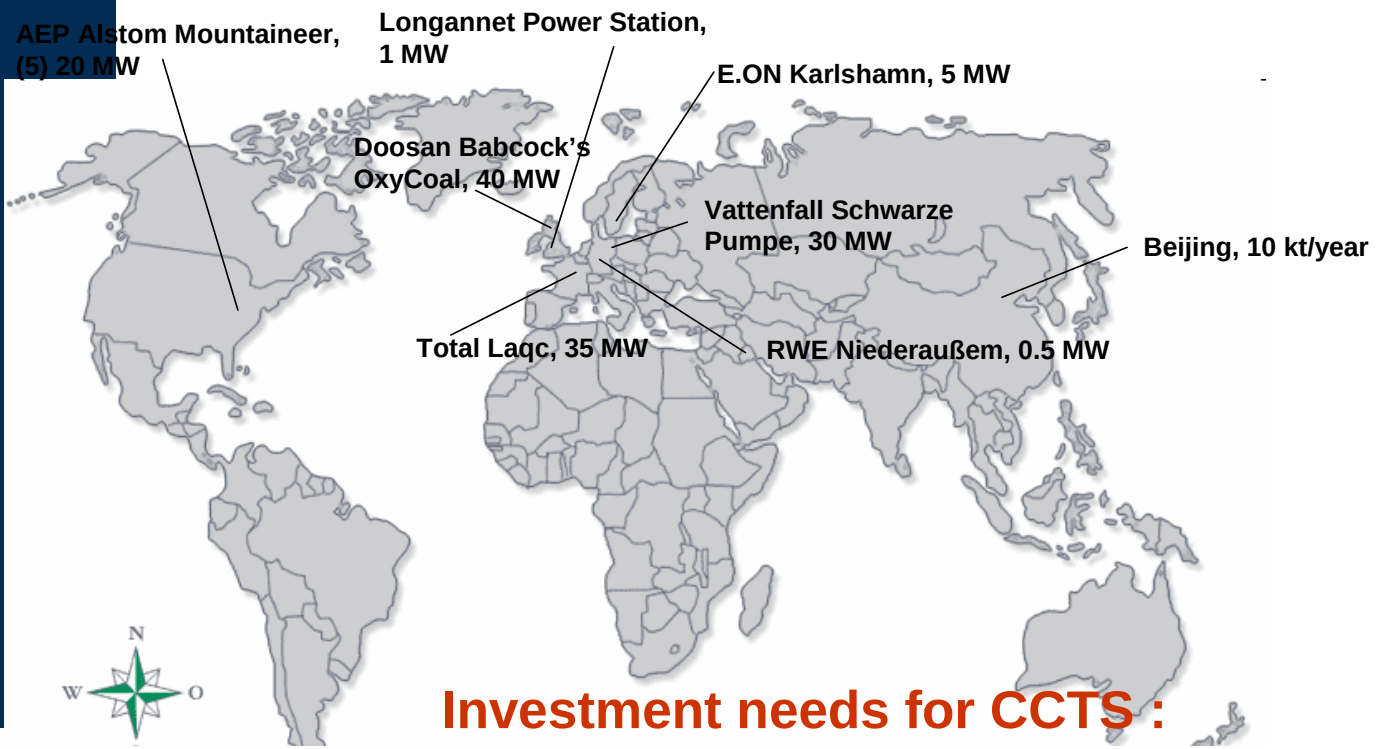
- **Demand flexibility / fuel switching** should be studied further regarding its ability to mitigate SoS issues in the EU
- Development and strengthening of **early warning and crisis prevention mechanisms** as well as the **implementation of regional emergency plans** should be encouraged
- **Transit across Ukraine:** the possibility of an independent Transmission System Operator (composed of Ukrainian, EU and Russian operators) should be seriously evaluated (=> reduction of disputes and increased investment)
- **Unconventional gas**:
  - legislation should be streamlined and reviewed in order to accompany any potential unconventional gas development
  - Generate an accurate survey of recoverable resources and production potential of unconventional gas in Europe, and evaluate its potential impact
- **Partnership with Suppliers:** Europe needs to have a robust policy with Russia, but also the Caspian and MENA regions showing pragmatism, partnership and commitment in respect to their development of gas export partners with Europe (also as they are expected to play a more important role in European gas supply after 2030 when the relevance of Norway and Algeria might decline)

- COAL

COAL Security of Supply: the issue is CCTS

- **The real issue in European supply security regarding coal is not the resource availability, but the absence of an economically and politically sustainable use of coal** for electricity, liquefaction, gasification, industrial applications etc., **due to obstacles in the implementation of a CCTS (carbon capture, transportation, and storage) value-added chain.**
- Upstream, there are little worries about the supply security of (steam) coal
  - Market monitoring should be continued, in particular on developments and prices in specific regions (e.g. China)
  - Competition authorities should continue to monitor international coal markets, with a special focus on mergers & acquisitions of “Big Coal”

The IEA Blue Map Scenario outlines a need of 100 serious CCTS demonstration projects until 2020



Investment needs for CCTS :

The next 10 years are a critical period for CCTS !

- Among the 62 announced CO2 capture projects, only 8 pilot projects are operating on a pilot scale.
- Assuming that all of the announced projects are realized by 2020 there still remains a gap of 40 projects to reach the IAE blue map scenario.

Coal:

CCTS

- **There is a real danger that the ambitious development plans in CCTS demonstration over the next decade will not be met; policies should aim on the acceleration of the development process**
- **The real bottleneck towards CCTS is the transport and storage infrastructure. Legal and technical uncertainty needs to be resolved**

➢The important and readily available funds for CCTS should be rapidly deployed. If industry does not respond to current incentives, the level of incentives needs to be raised to a reasonable level or pilot and demonstration projects should be carried out by public research institutions.

- Due to the lack of an inherent value of CO_2 the revenue stream strongly depends on future regulatory decisions; these should be made explicit as soon as possible

Coal:

CCTS

- The financial uncertainty surrounding future projects should be reduced. In the absence of clear CO_2 price corridors and signals, regulatory certainty can be created, e.g., by obliging new power plants in include a “capture-ready” option
- Future regulation needs to specify the allocation and financing principles for pipeline and storage, and access for 3rd parties
- Early planning of transportation routes is of utmost importance. The **State** bares a crucial role in the development of the transportation and storage infrastructure; the execution of the construction and operation of the transport network can be tendered to the private sector, or carried out by a state-owned network company.
- Synergies with the other energy network infrastructure (gas, electricity) should be considered
- The strong focus on the implementation of CCTS in the power sector in the past should be enlarged to industry which can be highly vulnerable to an abandonment of coal
- Alternative uses of CO_2 (to replace CCTS) should be further explored (e.g. methanol, chemicals)

- NUCLEAR

Nuclear energy

- **In order to respect climate policy goals, also nuclear has a potentially important role to play in worldwide and EU long term energy balances**.
- However, according to IEA and EC energy scenarios, the EU nuclear share is expected to reduce by half between now and 2030. As nuclear is presently providing two thirds of all low carbon electricity in the EU, this will create an even larger strain on fulfilling CO_2 targets.
- In fact, the so often announced nuclear renaissance is having a difficult birth: With 148 aging reactors in operation in 15 member states, there are presently just 3 nuclear plants under construction in the EU (Finland, France, Bulgaria).
- Recent developments in Japan clearly are prompting a thorough rethinking of nuclear energy policy around the world.

Nuclear energy

- Reasons for the stalling renaissance of nuclear energy are:
- **social acceptability** (political opposition) for a technology which is perceived as dangerous and for which the permanent waste disposal issue has still not been solved,
- **lack of human capacity** (Europe's industrial capacity of building nuclear power plants is said to be limited to maximum 4 per year, other regions seem to have the same problem of aging workforce) which is expected to worsen over the next years as specialists retire;
- **strongly increasing investment cost for nuclear power** due to, among others, improved safety and environmental standards. And contrary to the general energy capital cost index which has fallen by 20-30% since its peak in 2008, nuclear costs do not seem to have fallen over the last year ;
- **technical problems** with the new 3rd generation designs of all major manufacturers resulting in huge cost-overruns for the first realizations of the new designs;
- the **difficulty to finance hugely capital intensive plants in a market environment** and in particular after the financial crises;
- the increasing uncertainty on construction costs raise some doubts on the ability of nuclear power to foster a decrease in prices.

Nuclear energy

In this context government action is essential for:

- **promotion of public nuclear debates on safety, energy security of supply and climate change issues;**
- **promotion of human capital building;**
- **exploring regional centres for high level waste disposal;**
- **clearing the position of decommissioning funds.**

Policy reccomendations for Low Carbon energy (Renewables, nuclear, CCTS)

- supporting further integration of electricity markets;
- levelling the playing field for low carbon technologies;
- guiding investor assurances in licensing procedures;

As member states retain sovereignty over energy mixes, local political/public consent and support is vital.

The most efficient way for the EU to develop cost-effective low carbon power sources is to have a viable EU-wide emission trading system capable of delivering standardized carbon prices and/or an effective EU-wide carbon tax.

- ELECTRICITY

Security of Supply in the electricity sector

- **Electricity security of supply has implications along the whole chain:**

⇨ **Generation**
⇨ **Transmission**
⇨ **Distribution**
⇨ **Demand**

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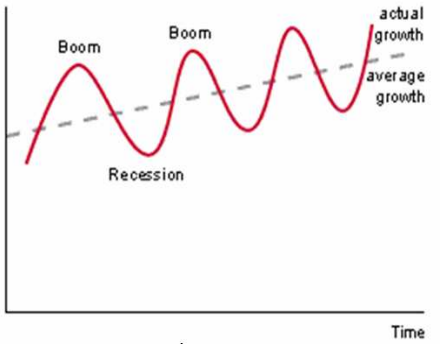
Power Generation *adequacy*

- Necessity to ensure *adequacy* of the generation system, i.e. its capability to keep the supply/demand balance;
- Need for a sufficient reserve margin and for a generation set well adapted to the load and to intermittent sources;
- Adequacy is not a priori guaranteed in a liberalized electricity market, with no more centralized planning;
- Risk of *boom-and-bust cycles*, with security of supply at risk during bust periods.



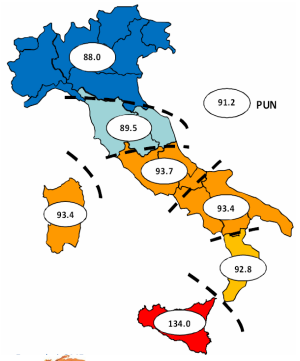
Power Generation – policy recommendations

- TSOs should have the task to determine how much new generation capacity of the different types is needed, when and where (the location in the network is very important);
- Regulators should consequently set up incentive / obligation schemes to push investors to pursue the “optimal” development of the generation set outlined by TSOs;
- The process should be coordinated and harmonized at the EU level (by ENTSO-E and ACER) to increase its effectiveness and to avoid market distortions.

Power Transmission – policy recommendations

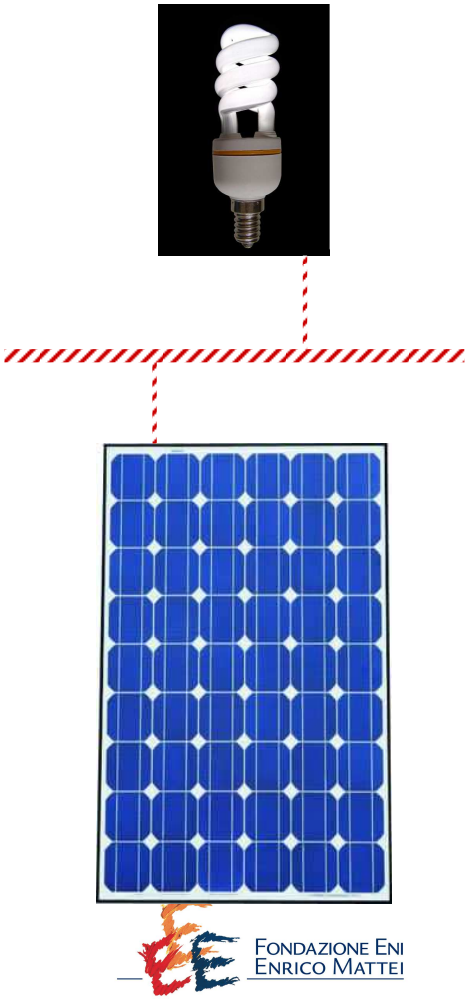
Measures to reduce uncertainties for investors (TSOs / merchant):

- pursue a more stable and harmonized regulatory framework at the European level, under control of the ACER;
- pursue more efficient authorisation procedures at all administrative levels, requiring the compliance with general framework guidelines;
- gain social acceptance by clearly stating and quantifying the public benefits of the projects in terms of security of supply, sustainability and economics;
- provide *"locational signals"*, to optimize short-term operation and long-term siting, thus harmonizing generation and transmission development.



Electricity Distribution – towards *active* and *smarter* networks

- Encourage cooperation among standardization bodies, regulatory authorities, grid operators and manufacturers to set open standards to ensure interoperability of smart grid devices and systems so as to avoid any technical barrier to their deployment;
- Support DSOs' investments in "smartness" through incentive / minimum requirements regulation based on the quantification of their effects and benefits, through appropriate indicators;
- encourage Demand Response (more on this later).



- RENEWABLE ENERGY

Renewable energy

Renewables can help to decrease EU energy import dependency. **RES should be supported in the electricity, heating and cooling and transport sectors. To this aim**:

- the current limited and dispersed support for RES-based heat needs to be improved;
- focus on 2nd/3rd generation biofuels;
- keep a level playing field among different technologies;
- the present technological uncertainty suggests the need to maintain some public support to a wide range of technologies, at least until the relative merits of different solutions emerge on the basis of solid experience;
- efforts to support RES are needed in all member states;
- RES policies should be supported by a strong energy efficiency policy;
- in the longer term, a beneficial political and regulatory framework promoting solar energy imports from North Africa should be created.

Renewable energy

To face the challenges resulting from an increased share of **fluctuating wind electricity**, several potential remedies may be applied:

- **Forecasting tools** and imbalances management should be improved.
- **Trading at the intra-day** market platform would imply a correction of all the imbalances whereas the imbalance payments only apply for the net system imbalances.
- **Storage systems** such as pumped-storage hydropower plants, hydro reservoirs, compressed air storage, flywheels or batteries may be used.
- **Smart grids** may contribute to the operation of the electricity system.
- The reinforcement and, the extension of the **electricity grid** is one main option to integrate large amounts of fluctuating electricity into the electricity system.

- ACCIDENTS AND TERRORISM

Severe Accidents and Terrorism

- In industrialized countries estimated expected accident risks are by far the lowest for hydro and nuclear power while fossil fuel chains exhibit the highest risks. The maximum credible consequences of low frequency hypothetical severe accidents, are by far highest for nuclear and hydro in the middle range for fossil chains and very small for solar and wind. For nuclear, the maximum consequences are expected to be substantially reduced for fourth generation plants.

- The overall accident risk for EU 27, depends on domestic accidents, but can be strongly affected by its total energy import share and actual composition of import countries, which is predominantly an issue for fossil energy chains. Risk reduction measures should aim to decrease import dependency, and to achieve a higher diversity among importing countries.

- The frequency of a successful **terrorist attack** with very large consequences is of the same order of magnitude as can be expected for a disastrous accident in the respective energy chain. Terrorists prefer soft targets.

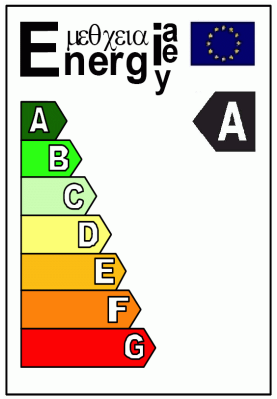
Severe Accidents and Terrorism

- Allocating appropriate resources for maintaining high safety standards of nuclear power plants and hydro dams matters also for security of supply.
- For oil and natural gas the focus should be on the exploration and production and on the major transportation routes.
- There is a need to integrate expert knowledge from a wide range of actors involving political sciences and intelligence information on the motivation of terrorists, military knowledge on scenario planning, and physical assessment of consequences.

- DEMAND

The Demand Dimension of Energy Security

- The promotion of end-use energy efficiency should be a priority, since actions in this field are the most cost-effective.
- Efficiency policies in the EU do work, but there is no silver bullet able to successfully address energy security and energy efficiency, unless it is so general that naturally encompasses different sectors and energy uses.
- The EU policy mix is quite effective, but more fine-tuning and coordination among member states is needed.
- EU Action Plans should be continued and made binding wherever effective, taking into account differences in the responsiveness of energy consuming sectors to efficiency policies.



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The Demand Dimension of Energy Security

- Cross cutting measures, in particular those related to marked-based instruments, have the strongest influence both on energy security and energy efficiency. It is recommended to consider the development of White Certificate market models at EU-level. Due account should be taken of successful deployment in some member states.

- Demand Response should be encouraged, with a rapid and extensive deployment of enabling technologies, such as smart metering, following best practices. Market design is crucial as it should exploit all the potential of DR.

- Demand Response programs should be designed so as to provide strong (i.e. able to ensure a substantial economic convenience in case of response) signals, as well as be simple and easily understandable by consumers.

- CONCLUSIONS

Conclusions

- Smart" energy policies must combine security of supply, sustainability and competitiveness without neglecting the international relations context .
- European climate policies bring about a significant double dividend in terms of reduced vulnerability to energy shocks. However low carbon energy scenarios require:
  - an improved framework and incentives for electricity investment (including renewables),
  - a high degree of integration of the European electricity systems,
  - a favourable institutional and regulatory framework for Carbon Capture Transport and Storage (CCTS),
  - no a priori foreclosure towards nuclear energy,
  - strong demand policies.
- The transition path to a low carbon economy is not granted. Adequate governmental support might be necessary.

Conclusions

- The **most efficient way** for the EU to develop cost-effective low carbon energy use is to have a **generalized and viable EU-wide emission trading system** capable of delivering standardized carbon prices **or an effective EU-wide carbon tax**.

- Energy security of supply and competitiveness converge when it comes to internal market's development. Integration of markets by developing regulatory policies, which enhance interconnections in gas and electricity infrastructure and thus foster competition, would be a big step in the right direction for European security of supply.

- The **unsatisfactory** functioning of the **international oil markets** and the **resulting uncertainty and volatility in oil prices is the main security threat** for future oil supplies because it hinders investment. Measures to reduce this artificially increasing volatility should be envisaged.

- Climate policies strongly influence the menu of policy solutions to energy security problems. Related uncertainties will affect policy making in the next decades. **Institutional solutions should be combined with a dialogue with EU's partners** on a medium term programming of investments in the energy sector, in a balanced perspective of mutual understanding.

Thank you!

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