WG Opportunities

Sub Working Group "Competitiveness"

ENEF ANSWER TO

EUROPEAN COMMISSION GREEN PAPER

A 2030 FRAMEWORK FOR CLIMATE AND ENERGY POLICIES

Introducing Statement

The contribution of nuclear power to EU 2030 energy and climate strategy

With around 15% (122 GWe) of the total installed capacity, nuclear energy currently produces around 30% of the EU electricity. Nuclear energy is a clean, affordable and reliable source of energy. The current fleet of nuclear reactors operating across Europe is a strong asset base supporting EU competitiveness:

- Through cost effectiveness
  - Nuclear electricity is competitive with electricity from fossil fuels.
  - The cost of nuclear electricity is stable and predictable due i.a. to a low proportion of the cost of fuel in the overall cost of nuclear electricity
  - And for Europe's energy intensive industries, stable, predictable and affordable energy prices provide a strong foundation for economic growth and jobs creation in the EU.
- As a basis of industrial development
  - The global growth of nuclear power in the years to come has strong potential.
  - European Union must maintain its industrial and technological leadership in nuclear operations and new build
  - EU and Member States must encourage a positive investment climate for the energy sector to compete successfully in the world's economy.
  - The Nuclear industry embeds a wide range of high technology skills requiring high skilled engineers and R&D. The skills developed in the frame of nuclear industry also provide benefit to other sectors

The nuclear fleet supports 250,000 direct jobs and around 800,000 jobs in total, in the EU (**Reference 1**).

For many power producers, when they are considering future generation capacity needs, the first choice is the long term operation of the existing nuclear power plants. Lifetime can be extended beyond 40 years, at least up to 60 years whilst continuing to meet the highest safety standards. Lifetime extension to 60 years is a fact already for many plants worldwide and within the EU. That means that in 2030 a significant share of the existing plants will still be operating: e.g. about 90 GWe if the average lifetime is 50 years. Moreover, new nuclear plants are under construction or planned, so that more than 100 GWe of nuclear capacity is expected in 2030. That means in 2030 the EU can still benefit from a balanced, cost efficient and low carbon energy mix.

Which energy strategy for 2030?

European energy policy is founded upon the three pillars of sustainable development and is implemented in the power sector through the internal electricity market. Very significant milestones will be reached: the completion of the internal market in 2015 and the 3x20 targets in 2020. It is now time to look beyond 2020 and to propose subsequent possible paths towards a decarbonised energy system, following the approach of Energy Roadmap 2050. On the path from 2020 to 2050, we now need to define the energy system we want by 2030 and beyond since investments decided now will determine the system for a long time.

As the most compelling priority, Europe should target **a balanced achievement of the three objectives**: security of supply, competitiveness and decarbonised energy.

Decarbonising: possible but not at any cost

The objective of decarbonised energy looks achievable in the scenarios described by the EC Communication on Energy Roadmap 2050. The common features of all those scenarios are the strong increase of electricity share in total energy consumption and the strong decrease of oil and coal consumption. In the electricity sector, that means the energy mix would mainly include renewables, nuclear and gas. However, important questions are raised also.

First, it is assumed in all the decarbonisation scenarios that global fossil fuel prices will be lower than in the more recent “Reference scenario” (reflecting current trends): e.g. an oil price of 79 USD/bbl is assumed in 2030 whereas in the last IEA/WEO (2012) the trend towards higher prices is confirmed, at 125 USD/bbl in 2035. The lower prices in those scenarios are derived from the assumption of a global commitment on climate change mitigation policy, driving a reduction of global fossil fuel consumption. Clearly, the EU would embark on thorough decarbonisation only if the other regions were also committed to strong reductions of GHG emissions. That means that as long as the commitment of the other regions is not warranted, the EU had better follow “no regret” pathways, i.e. the EU should not put at risk its competitiveness through a singular and extravagant climate policy: the extra costs induced by the deployment of low carbon generation should be kept moderate.

Second, the different decarbonisation scenarios should be analysed carefully, since they are likely to display varying performances with respect to the system reliability, total electricity generation capacity requirements and **the total cost of electricity supply**. They rely on different shares of renewables, nuclear, CCS and gas, require different transmission and distribution network solutions (and costs), and require different storage solutions/capacities and costs (which are very high when the share of intermittent renewables reaches 80% or more). Those issues are analysed in **Reference 2** and it is clear that scenarios with a significant share of nuclear (20% to 30%) are less costly and more robust (that is, less sensitive to the assumed input values in the long term) than those relying on a very high share of renewables.

Third, CO_2 emission price is a key driver in the decarbonisation scenarios, reaching values well above 50 €/t. Currently, the CO_2 price remains well below10 €/t. A prerequisite of decarbonisation is the proper functioning of the European Trading System (ETS). A more ambitious annual reduction of the cap has to be planned and imposed, but also protections against carbon leakage will have to be implemented. Moreover, since the vehicle of decarbonisation is the investment into low carbon technologies, it has to be driven by a compelling long term target. **Setting a target for GHG emissions in 2030 (e.g. -30% or -40% vs 1990) is essential to drive the electricity market towards the decarbonising path.**

The value of secure electricity supply

In the power sector, security of supply means satisfying two conditions together.

First, the long term security of supply will be ensured through a lower dependence on imported oil and gas; lower dependence is required to decrease the vulnerability to fossil fuel price volatility, to minimise the consequences of any disruption of supply, to improve the negotiating position of the EU when confronted by a limited number of producing countries/suppliers and to improve the trade balance of EU. Decarbonising scenarios in the Energy Roadmap 2050 would achieve a level of import dependency limited to 55% in 2030 and lower than 40% in 2050.

Second, in the short term and on a permanent basis, the reliability of electricity supply through the grid is a paramount condition for all households and all sectors of the economy. The current electricity supply system in the EU Member States was built to comply with a high level of quality (frequency and voltage stability) and a very low risk of disruption. All the components of the system: energy mix, generation technologies, transport and distribution networks contribute to this objective.

Clearly on the latter point, the increasing share of intermittent energies in power generation raises new issues. The rest of the supply system is requested to adapt to their expansion, implying more extensive grid connections, added dispatchable back-up capacities, storage capacities, demand side flexibilities, and a wider variation range of frequency and voltage. As a result, significantly higher system costs are necessary to obtain the same level of reliability. The additional system costs grow with an increasing share of intermittent renewables. This issue has been quantitatively assessed in **Reference 3,** showing the added costs in several EU countries. For instance, when RES penetration reaches 30%, the extra system cost induced by onshore wind reaches more than 20 Euro/MWh, to be added to a generation cost about 80 Euro/MWh; in the case of offshore wind, it reaches more than 30 Euro/MWh, to be added to a generation cost about 130 Euro/MWh. The study shows that no averaging effect should be expected when expanding RES production and that system costs tend to diverge with RES expansion.

Assessing true competitiveness

Competitiveness should be assessed through the electricity price for the end consumer. The price will depend on many factors: total cost of supply, but also electricity market dynamics, price regulation in some countries, taxes varying from one country to another. The deployment of renewable energies also influences the prices, but in a strange way: they can depress the wholesale market price (driver: the marginal cost) while increasing the end user price at the same time (driver: RES development financed through non-energy taxes and levies). For example, in 2013 in Germany, the price on the electricity wholesale market has fallen to 45 Euro/MWh as elsewhere in Europe but the households do not benefit from this decrease, they are paying highest ever prices well above 250 because of an added "EEG" surcharge reaching 53 Euro/MWh, (and financing the investments in renewable energies). The costs have to be paid somehow by somebody. It is of prime importance to carefully assess all the system costs (as proposed in Ref 1 and 2) and to examine carefully how they are likely to evolve in the future, depending on all the relevant drivers. Learning effects will drive the investment costs downwards for offshore wind as well as for Generation 3 nuclear plants, but other drivers may counteract, such as the growing scarcity of "good sites" with favourable wind and soil conditions. The demand for underground lines in more and more areas may also increase the cost of transmission and interconnections. Since electricity prices in the EU are already higher than in other regions, it is important to select the most cost efficient paths towards decarbonisation and security.

We conclude that reaching a balanced combination of the three objectives calls for a balanced energy mix. Every component has a role to play. Targeting too high a share of intermittent renewables would be counter-effective. It would raise several uncertainties about generation adequacy, grid stability, needs of new technologies for storage and resulting system costs. Current experience in several EU countries suggests that problems become significant above a share of 40% of generation. Nuclear energy should therefore remain a key component of low carbon energy mix, supplying base load electricity at low cost and contributing to grid stability. For peak load, low investment dispatchable means of generation such as gas fired turbines would remain the favoured option. **For that reason, no new specific target on RES share in 2030 should be set: the market should find by itself the most appropriate mix to reach the decarbonisation target while ensuring highest possible competitiveness and security.**

A last important question has to be discussed. Is it sufficient to set a CO_2 target to orient the internal electricity market towards the balanced mix of policy objectives? Past experience suggests that even with a relatively high price of CO_2 the lifecycle cost of combined cycle gas turbines may remain the lowest when the cost of investment of nuclear power and renewables is penalised by high cost of capital. Low carbon technologies such as nuclear power, offshore wind, coal plants with CCS all are characterised by a high upfront cost of investment followed by low cost of operation, as opposed to gas plants. Financing such high investments is difficult on a market with many uncertainties (future regulation changes, volatile gas and electricity prices, etc…). In a short term approach the investors will rather turn towards gas plants lower investment: without dedicated policy, no decarbonisation of the mix will happen. Then public support to investment in low carbon technologies can help under different forms (loan guarantees, tax credit, EIB loan, etc…); and it is justified under a set of conditions:

- The supported investments contribute to public goods (here, climate protection and energy security).
- The support remains technology neutral = no low carbon technology is excluded.
- The support is allocated to "First Of A Kind" projects in priority since successful project return of experience by "first movers" will give confidence to others.
- The long term view is necessary to hold on the orientation and it is the role of public policy to encourage a long term approach.

From a balanced triangle of objectives, we derive the need of a balanced energy mix. And from this needed balanced energy mix we derive the recommendation of a balanced support to investments in low carbon technologies, including nuclear power.

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Reference 1: Socio-economic benefits of the nuclear industry in the EU to 2050 (ENEF April 2013)

Reference 2: Evolution of Electricity Costs**,** KEMA Final Report to DG ENER, January 2013
http://ec.europa.eu/energy/nuclear/forum/opportunities/competitiveness_en.htm

Reference 3: Nuclear Energy and Renewables, System Effects in Low-carbon Electricity Systems, OECD/NEA 2012

ENEF ANSWERS TO EUROPEAN COMMISSION GREEN PAPER

4.1. General

Which lessons from the 2020 framework and the present state of the EU energy system are most important when designing policies for 2030?

- Contradiction between RES support instruments and electricity market is resulting in high electricity prices for the end consumer in spite of low wholesale market prices, the latter discouraging new low carbon investments such as nuclear. This has potential future negative consequences on generation adequacy and CO2 emissions.

- The EU is losing competitiveness because of high consumer energy prices while the rest of the world is emitting more CO2 (global +1.4% in 2012, record high at 31.6 Gt according to IEA)

- The EU is not insulated from the rest of the world and this has hampered the effectiveness of 2020 framework.
    - The impact of international fossil fuel market prices: no more switch from coal to gas but the reverse, more coal fired plants are being built and operated because of lower prices of coal and of CO2 emissions, with a long term negative impact even if they are supposed to be "capture ready".
    - The carbon leakage and suffering electro-intensive industry.
    - Excessive support to buyers of renewable energy technologies has created a deceiving boom, opened the way to Chinese dumping and led to the collapse of European -PV industry.
    - The lack of new nuclear power programs in the EU is impacting European industry and leading to decreasing European nuclear leadership to the benefit of Asia and Russia.

- Security of supply, meaning fuel supply, generation adequacy and reliability of electricity grid, is an important component of energy policy. But the rising share of intermittent sources, such as solar and wind, makes it more difficult to ensure adequate and reliable electricity supply. Back-up capacities such as CCGTs are supposed to be connected when solar and wind generation weaken, but investing in such back-up units is not profitable today because the expected electricity price is uncertain at best and the expected load factor too small. Reserve capacity is needed but it has to be rewarded somehow. The effective installation of more interconnections and storage will help but will take time.

- 2020 target of minus 20% for GHG emissions looks accessible. However, in the short term CO2 emission price within ETS remains very low, too low to drive the market towards decarbonised generation. Decarbonising policy cannot be effective if capital intensive technologies are not incentivized by the market design, since most of low carbon technologies, such as nuclear, offshore wind, coal + CCS, are capital intensive. Only renewable energy technologies benefitting from subsidies and priority access to the grid have been able to increase.

- From above we conclude that the internal market in electricity has to be improved. Competitiveness and security of supply will deteriorate with further growth in the share of intermittent and subsidized renewable generation as postulated in some current post-2020 scenarios. <u>An integrated technology neutral approach is necessary, leaving the market to operate.</u>

4.2. Targets

Which targets for 2030 would be most effective in driving the objectives of climate and energy policy? At what level should they apply (EU, Member States, or sectoral), and to what extent should they be legally binding?

One target for each of the 3 policy objectives is recommended:

GHG emissions:
An ambitious GHG emission reduction target is the most important target to be set and implemented, such as -40% in 2030 compared to 1990 at EU level, with adequate burden sharing between Member States, legally binding. Each Member State will remain sovereign to decide on its energy mix contributing to the reduction of GHG emissions. Driving the market to meet the target essentially requires an effective ETS, where the cap evolution would ensure CO2 emission price high enough to foster investment in low carbon technologies.

Security of supply:
Non compelling targets should be proposed, at EU level.

- Long term security at EU level: energy dependency on import should be decreased (both in % GDP and by increased geographic diversity) by 2030, keeping in mind future competition between big energy importing regions: China, Japan, South Korea, India and EU.
- Short term security at MS level: within a more interconnected EU, harmonising the MS criteria for power generation adequacy, such as the annual disruption expectancy.
- Grid stability should not be degraded by future developments.
- Setting a target on GHG emissions and not on renewable share will benefit to security of supply since it will encourage the deployment of all low carbon technologies; in particular, nuclear energy deployment will have a positive effect on all aspects of security of supply (less fossil fuel dependence, generation adequacy, grid stability).

Competitiveness:
The role of a well functioning market should be emphasized; relevant performance indicators such as the Lifecycle Cost of Electricity supplied (LCOE), the total electricity consumer price, the cost per avoided ton of CO2, should be monitored at EU and MS level, to help comparison with other regions.

Have there been inconsistencies in the current 2020 targets and if so how can the coherence of potential 2030 targets be better ensured?

Yes, there have been inconsistencies:
1/ Setting a binding target on the share of renewable energies has led to a high cost per ton of CO2 avoided and at the same time it has accelerated the collapse of ETS price, which in the end discourages investment in unsubsidized low carbon technologies and so hampers long term reduction of emissions.
2/ Setting a target on reduction of primary energy consumption for the sake of energy efficiency can lead in some cases (e.g. heating) to replace low carbon electricity with fossil fuel, resulting in higher GHG emissions; reciprocally adding CCS to coal fired plants results in lower efficiency.

Coherence will be better ensured if only one binding target or benchmark is proposed <u>for each of the three pillars</u>. Moreover, coherence with the internal electricity market design has to be ensured, which means no market distortion should result from the targets per se. Setting a binding share for renewables, with strong support though grid priority and feed in tariffs, has strongly distorted the market and should not be proposed again.

Are targets for sub-sectors such as transport, agriculture, industry appropriate and, if so, which ones? For example, is a renewables target necessary for transport, given the targets for CO_2 reductions for passenger cars and light commercial vehicles?

No answer

How can targets reflect better the economic viability and the changing degree of maturity of technologies in the 2030 framework?

If no technology specific target is imposed, the market will select the most viable and mature technologies. For that reason no target value should be set for the share of renewable in electricity generation.

How should progress be assessed for other aspects of EU energy policy, such as security of supply, which may not be captured by the headline targets?

See above where non binding targets are proposed for security of supply.

4.3. Instruments

Are changes necessary to other policy instruments and how they interact with one another, including between the EU and national levels?

ETS needs structural improvement to effectively drive the market towards low carbon production.

Participants in the market should be allowed to use long term contracts.

Electricity market design should be adapted to better accommodate long term energy investments; low carbon technologies, such as nuclear power, coal power stations with CCS and offshore wind, are capital intensive; with the current market design price signals are based on fossil fuel prices and do not integrate long term objectives; they provide no incentive to invest in capital intensive technologies, which will bring high benefits in the long term.

How should specific measures at the EU and national level best be defined to optimise cost-efficiency of meeting climate and energy objectives?

Limit the number of policy targets, set them as stable and long term enough, do not impose the instruments to reach the targets, but rather ensure proper market functioning. The competitive market will ensure cost-efficiency.

Stability of decisions at EU level – no change every year

How can fragmentation of the internal energy market best be avoided particularly in relation to the need to encourage and mobilise investment?

Competitiveness/affordability and security of supply/reliability of low carbon energy should be the benchmark to judge the balance of investments in the EU. Noting the importance of nuclear in meeting the EU energy policy goals, MS should have the power to encourage investment in nuclear power.

Which measures could be envisaged to make further energy savings most cost effectively?

No answer

How can EU research and innovation policies best support the achievement of the 2030 framework?

In the long term, public funding of R&D is the most efficient instrument for public aid to new technologies. Shared R&D programs at EU level are an appropriate means to limit the total cost of development and should include nuclear energy.

4.4. Competitiveness and security of supply

Which elements of the framework for climate and energy policies could be strengthened to better promote job creation, growth and competitiveness?

Job creation and growth still rely on competitive industrial capacities in our modern economies. Climate and energy policies should not only drive the internal demand towards more efficiency and less carbon emitting services, but also drive the internal offer so that it can contribute at least partially to the new demand. Otherwise the EU will depend more and more on foreign technologies and industries. Lessons should be drawn from the current evolution of photovoltaic industry in the EU. That means a real industrial policy has to be developed, with priority for high technologies to maximise domestic added value and create more high level jobs.

The following objectives should be more strongly addressed in the framework:
- Minimising the total cost of electricity supply, which is a requirement to keep competitive industry in the EU - for a target of CO_2 emission reduction it means minimising the average cost per ton of CO_2 avoided;
- Supporting EU energy sector trump cards, such as the European nuclear industry;
- Negotiating balanced free trade arrangements with other regions to avoid the EU market is open to foreign actors much more than their own domestic markets.

What evidence is there for carbon leakage under the current framework and can this be quantified? How could this problem be addressed in the 2030 framework?

No answer

What are the specific drivers in observed trends in energy costs and to what extent can the EU influence them?

The first driver is the <u>international oil price</u> which is bound to remain high according to IEA. The EU needs to decrease dependence on oil, e.g. in transport sector. That means both more energy efficiency and a higher share of electricity in energy consumption.

The second driver is the <u>price of imported gas</u>. The EU will be in better position to negotiate with gas suppliers if competing alternative sources of energy such as nuclear energy are kept at sufficient level in the mix. Access to diversified sources of gas is also helping as already currently developed, but it remains difficult for a number of Member States.

The third driver is the <u>cost of new renewable</u> energies; it is an increasing burden as long as their share increases more quickly than their “unit cost” is decreasing through learning effect. Unit cost should be understood here as not only the cost of generation but also the impact on total system cost (need of back-up capacity, added grid costs, etc…). To foster the deployment of renewable energies, the use of Feed In Tariffs and free grid connection should be phased out in the long run. Technology neutrality should prevail in mean time. Other support schemes can help controlling the total costs: contracts for difference, premium tariffs, long term power purchase agreements, co-funding of demonstrators, etc…

The fourth driver is the cost of capital. The cost of capital is sensitive to risk perception by the investors. The EU policy can influence risk perception through more stable regulatory framework, through loan guarantees, through co-funding by financial institutions such as the European Investment Bank (cf ENEF Opportunities WG Report on Financing, Prague, May 2013)

How should uncertainty about efforts and the level of commitments that other developed countries and economically important developing nations will make in the on-going international negotiations be taken into account?

EU can pursue climate policy as a world leader but it should be at reasonable cost to remain competitive: a real "no regret" option should prioritise lower cost solutions as long as other regions are not really embarking in the same constraining climate policy. That means minimising the cost of low carbon energy, by keeping a sufficiently high share of nuclear energy, through Long Term Operation and new build.

How to increase regulatory certainty for business while building in flexibility to adapt to changing circumstances (e.g. progress in international climate negotiations and changes in energy markets)?

Regulatory certainty and flexibility can best be ensured together if market regulation is focused on top level priorities without a priori specific technology picking: it should remain technology neutral. In the electricity market, value has to be clearly assigned to two top priorities:

- Reduction of GHG emissions, through the 2030 emission target and supported by a more robust ETS;
- Reliable and secure power supply, best ensured if the share of dispatchable power generation means remain sufficient.

The framework should orient the market towards the technologies offering the double value, being both low carbon and dispatchable. The market will select the most competitive among them. Nuclear power is one of them.

How can the EU increase the innovation capacity of manufacturing industry? Is there a role for the revenues from the auctioning of allowances?

NER 300 type tools should be open to all low carbon technologies including nuclear energy.

How can the EU best exploit the development of indigenous conventional and unconventional energy sources within the EU to contribute to reduced energy prices and import dependency?

No answer

How can the EU best improve security of energy supply internally by ensuring the full and effective functioning of the internal energy market (e.g. through the development of necessary interconnections), and externally by diversifying energy supply routes?

Diversity of energy sources and origins, diversity of technologies and domestic industrial know-how and capacity are the main contributors to security of supply.

Limit the share of intermittent sources, which are inducing instability of the grid, calling for costly counter-measures (e.g. back up capacity and storage).

As concerns grid infrastructure, give priority to interconnections rather than to RES specific expensive connections.

Foster peak shaving by interconnection, storage, and demand side management (smart metering)

Keep nuclear power as base load.

4.5. Capacity and distributional aspects

How should the new framework ensure an equitable distribution of effort among Member States? What concrete steps can be taken to reflect their different abilities to implement climate and energy measures?

The new framework should ensure that the right for a MS to select its mix is not hindered by other MS.
Incentives as regards achieving the targets could be set up.

What mechanisms can be envisaged to promote cooperation and a fair effort sharing between Member States whilst seeking the most cost-effective delivery of new climate and energy objectives?

No answer

Are new financing instruments or arrangements required to support the new 2030 framework?

Since the market has not delivered till now (ETS price low and the wholesale electricity prices low) and will not in the near future, <u>specific long term financing mechanisms</u> tailored to reaching the new targets and related developments of the 2030 framework have to be defined. They should be common to all Member States. National grants and subsidies should be progressively phased out in order to leave room for long-term financing sources priced on commercial terms. A clear long-term vision strongly expressed by the EU as a whole would support the mobilization of the large funding requirements attached to transition to low carbon energy. A set of clear milestones and long-term goals and a stable regulatory framework would help. This is all the more important that a substantial proportion of such funding needs will have to come from the private sectors.