Energy Intelligence for Europe

The Euratom Treaty and Future Energy Options: Conditions for a Level Playing Field in the Energy Sector

CONFERENCE REPORT

Friday, September 23rd 2005, at the Danish Parliament Building Christiansborg

Conference by NOAH - Friends of the Earth Denmark,
The Danish Ecological Council and The Danish Organisation for Sustainable Energy
www.energyintelligenceforeurope.dk

"Isn't it high time to review the Euratom Treaty, abolish the different standards, the particular conditions, and finally create a level playing field for all energy sources and in particular for energy efficiency and renewable energies? Isn't it urgent to get legally binding decisions on nuclear security, safety control, waste management, decommissioning, effectively under co-decision procedures with the European Parliament? Isn't it indispensable to finally adopt transparency and democracy in a sector that has too often escaped public scrutiny and control?"

Question asked by Dominique Voynet, French Senate member and former Minister of the Environment, to Andreas Molin from the Austrian Environment Ministry and Nina Commeau-Yannoussis, Head of Unit of Energy Policy and Security of Supply, European Commission Directorate-General for Energy and Transport, during the debate "What Future for the Euratom Treaty?"

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SUMMARY AND RECOMMENDATIONS

On Friday, September 23rd 2005, six Danish, Swedish and International NGOs convened an international conference at the Danish Parliament Building Christiansborg: **Energy Intelligence for Europe, *The Euratom Treaty and Future Energy Options: Conditions for a Level Playing Field in the Energy Sector***.

The conference conveners were *NOAH – Friends of the Earth Denmark, The Danish Ecological Council, The Danish Organisation for Sustainable Energy, The Society for Green Technology, The Swedish Anti Nuclear Movement* and *Friends of the Earth Europe*.

The conference was organised by *NOAH – Friends of the Earth Denmark, The Danish Ecological Council, The Danish Organisation for Sustainable Energy.*

The conference had two main objectives: To assist in promoting the initiative of an intergovernmental conference on the Euratom Treaty and to provide the Danish Government with high quality information and analysis to adopt a proactive policy on the future of the Euratom Treaty.

In the "period of reflection" after the recent rejection by French and Dutch voters of the European Constitution, which has to be put to use in the best possible way, two vital questions must be answered or at least reflected on: *How important is Euratom in the European dialogue and how is the continued and unaltered existence of the Euratom Treaty going to influence the perception and reception of the European Constitution and the development of the European Union in the future?* One could say this conference set out to try to answer the first of these questions in order to make an answer to the second question possible.

Conclusions with respect to Nuclear Issues

I. The following conclusions can be drawn from the conference with respect to **nuclear issues**:

A. *Although there is currently talk of a renaissance of the nuclear industry globally and in Europe, this does not correspond to reality*. The nuclear power plants are aging and there is no indication that it will be possible to replace the units that are being shut down. Over the next decade, when 80 units in the world turn age forty, it is impossible that all of these units will be replaced because it would be industrially not feasible. The only way to maintain current operating numbers is to extend the lifetime of the reactors.

B. *Nuclear power is not a solution to the climate problem*. Although nuclear power emits less CO_2 than fossil fuels and even less than many renewables in some calculations, it is impossible to compare the same system with or without the use of nuclear power on the basis of emissions

avoided. Also, there is no correlation between emission reductions trends in specific States and their respective share of nuclear power. World IIASA[1] scenarios, which cross hypotheses on renewables and nuclear share with hypotheses on energy demand, show a low additional value of nuclear power. It can also be argued that in terms of greenhouse gases abatement efficiency per euro spent there are a number of options, in particular energy conservation and co-generated biomass that are significantly more effective than nuclear power.

Whether the nuclear option is legitimate in the context of climate change also has to be evaluated in the perspective of the problems facing nuclear power today (accident and proliferation risks, waste management, potential terrorist targets, etc.). The nuclear option is not consistent with the gap between actual development of nuclear energy and levels of emission reduction that must be achieved.

As the potential of alternatives increases, the effectiveness of nuclear substitution decreases. Other advocated tools in this respect are energy efficiency and renewables. The issue is to choose between these options in a policy that is a breaking policy in any case. In this context it should be remembered that the systemic impact of nuclear power has been an obstacle to the development of ambitious demand side policies and renewable programmes everywhere.

***C**. The Euratom Treaty has had and still has a significant importance for the development and maintenance of nuclear technology in Europe, both through its very existence, the associated institutional credibility that it gives and through specific support mechanisms*. The overall intentions of the Euratom Treaty can be seen in its preamble, which states that "nuclear energy represents an essential resource for the development and invigoration of industry" and that Euratom is "resolved to create the conditions necessary for the development of a powerful nuclear industry". The Euratom Treaty affects the economics of the nuclear industry through direct and indirect financial support in the following ways:

(1) Direct financial support: This kind of support includes *the Framework Programme (FP)*. The total proposed budget for the latest of these Programmes - the 7th FP - is €73 billion, compared to the €17.5 billion of the 6th FP. The Commission proposal for the 7th FP highlights the special case given to nuclear power, in that firstly, the research and development budget is separate from that of other energy programmes, which effectively means that nuclear is protected from the other debates about how the limited funds for energy R&D should be allocated and secondly that there is no Parliamentary co-decision on the Euratom programme, only consultation. Nuclear power - fission and fusion - is proposed to receive 60% of the total funds allocated to energy technologies in the EU. The Joint Research Centre and nuclear fission research programmes are expected to focus on radiation protection, nuclear waste management and the development of new reactor designs, including the Generation IV reactors. Fusion research is set to receive a considerable boost in its funding, an increase from roughly €200 million per year over the years 1995-2006 but rising to €600 million per year at the end of the 7th FP.

The direct financial support also includes *the Euratom Loans Programme:* Since 1977 around €3.2 billion worth of financial support for nuclear power has been awarded by the Euratom's nuclear loan facility. The loan facility enables nuclear companies to obtain financing for large projects,

[1] IIASA = The International Institute for Applied Systems Analysis.

which given the uncertainty of nuclear construction, with its history of delays and cost overruns, they might not be able to obtain otherwise.

Finally, the direct financial support includes *Nuclear Programmes outside the European Union:* Under the Euratom Treaty, the European Commission, with approval of only the Council and not the Parliament, negotiates bilateral Nuclear Co-operation Agreements with a number of States. This has included China, Kazakhstan, Japan, Russia, Ukraine and Uzbekistan. Apart from encouraging joint research efforts into nuclear waste and nuclear safety, these programmes encourage the exchange of nuclear material and non-proliferation measures and are also designed to support the mutual development of the nuclear sectors.

(2) Indirect financial support: This includes the Commission's approval of State Aid. Currently, the Commission is considering three complaints or applications for State Aid regarding the nuclear sector. These pertain to the British Nuclear Decommissioning Authority, Finnish Nuclear State Aid and Slovakian Nuclear Levy.

The indirect financial support also includes *Support by Non-Action*, not least *failure to act on Nuclear Decommissioning Funds used for market distortions.* Although the size of these final funds are difficult to forecast, as this will depend on the interest rates of the accounts that the funds are placed in and on the technical aspects of the decommissioning and waste management activities, it must be recognised that the mechanism and amount of funds that utilities are required to put aside should be harmonised between Member States, both to ensure adequate funds are available and to avoid market distortions. Such a harmonisation must guarantee that funds controlled by the nuclear operators are separated from their other financial resources.

D. *The Euratom Treaty distorts competition in the European electricity markets*. Nuclear technology has its own Treaty - the Euratom Treaty - singling out one energy source and one industry sector, which therefore are treated differently from all other sectors in the Community. The direct and indirect support described above gives evidence to this fact. The Euratom Treaty places a privileged status for state funding on the nuclear industry. The European Court has never clarified the legal relationship between Euratom and EC state aid rules. Also, there is no democratic control through the European Parliament on matters relating to Euratom and loans for nuclear power can be granted without consulting the European Parliament. Hence, it is clear that Euratom makes competition in the internal electricity market very difficult by giving one third of the EU power supply, namely nuclear power, special privileges.

E. *A European Constitution without the Euratom Treaty is a realistic option*. The realism of this approach is highlighted by the first preliminary draft for Euratom Reform submitted to the Convention in December 2002 - known as the Penelope Paper - prepared by a specific task force in the Commission headed by Francois Lamoureux, the then Director General of the European Commission Directorate-General for Energy and Transport. The Penelope Paper envisages the creation of an addition act on the Peaceful Use of Atomic Energy to replace the Euratom Treaty. The Penelope proposal also inserts language on compatibility of investments with the single market. This is significant, because it emphasises the deficiencies of the current Euratom Treaty and its compatibility with the European electricity market.

Conclusions with respect to Renewables

II. The following conclusions can be drawn from the conference with respect to **renewables**:

A. *Renewables have the potential to provide the world population with energy.* With application of decentralised and centralised energy sources, the use of offshore wind farms down to 20 m. depth, limited use of onshore wind potential on farmland, solar rooftop systems and building integrated solar systems and residues from agriculture used as biomass, the world-wide energy need can be fulfilled in a demand scenario where high efficiency throughout the whole conversion chain is taken into account.

In this global scenario for the period 1994-2050, which assumes global solidarity and no major wars, the welfare that is the result of this will not decrease, because the scenario takes into account all the energy efficiency measures. The assumption is that by the mid 21st century, the average technology in use will equal the best current technology, with respect to energy efficiency. This is compounded with increasing population, increasing urbanisation, and increased per capita activity level by an average factor 2.7 for energy use. The GNP activity growth factor will be larger due to the de-coupling of economic and energy growth, and the distribution between regions will not be even, because a larger growth rate is assumed for the presently poor regions. Hence, in large countries like China and India, there will be a growth of about 4 times energy end-use per capita, but if the growth excludes energy used for food there will be almost 8 times more consumption compared to today.

B. *A sustainable energy transition for EU is possible*. Within the framework of a global vision for a change to sustainable energy until 2050, INFORSE-Europe and its member-organisations have developed a vision for a transition to sustainable energy in Europe. The vision follows the EU target of 12% renewable energy in 2010, and shows how to realise the target of 25% renewable energy in 2020 as well as a transition to more than 95% renewable energy by 2050.

In this scenario *nuclear energy* is expected to be phased out as the current nuclear reactors are stopped because of age, safety problems, etc. This is expected to happen until 2020. For *fossil fuels* are expected a gradual phase-out of coal-use, a slow but increasing phase-out of oil use till 2050 and a growing gas consumption until 2010, followed by phase-out until 2050. *Gas networks* are expected to have decreasing importance. Energy trade is expected to be much less than today, and if the efficiency potentials are realised *EU-15 might not be an energy importer after 2040*.

With respect to the development *wind power*, the vision refers to the "Windforce10" report (updated in 2002 with the Windforce12 report), which has given an overview of how it is possible to realise a large development of wind power in EU-15, following the current trends. The expected development starts with realisation of the 70,000 MW target set by European Wind Energy Association and others. It continues with a target of 220,000 MW wind power for 2020 and a final

development to 375,000 MW wind power by 2040, utilising 88% of the estimated potentialVision2050 targets from Windforce10). According to Vision2050 it is not necessary to use all the full potential of wind power because of the large use of energy efficiency. For the ten new EU countries a modest development to 15,000 MW of wind power is expected.

Solar heating as well as *solar electricity* is expected to play large roles. Solar heating can cover 10% of the heating demand, and more if seasonal storages are introduced. In Vision2050, the use of solar electricity is expected to increase to about 5.5 m^2/capita in 2050 with an expected annual average output of 100 kWh/ m^2. This would give an expected electricity production of almost 200 TWh for EU. Most of the development will take place after 2020.

Biomass for energy is expected to grow to the limits set by environmental criteria and the use of a maximum of 14% of agricultural land for energy crops.

The vision is based on rapid growth of *energy efficiency* to reach an average level in 2050 similar to close to best available technologies today. Most energy consuming equipments will be changed several times until 2050, and if new generations of equipment are made with optimal energy performance, and markets are made to promote the most efficient technology, it will not be a problem to reach today's best available technologies, even though the efficiency gains required are very large, i.e. in the order of 4 times.

For *buildings* in the 15 "old" EU countries, the target heat consumption is 60 kWh/m^2 as 2050-average. This will require about a 57% reductions compared with current EU-average. This could be realised by raising building-codes to current low-energy housing levels by 2010, requirements that all major renovations include a major energy-renovation, and the embarking on a major program for passive-houses to achieve that the majority of new buildings are passive houses. For the new EU-countries is also expected a 57% increase in efficiency for space heating, but at a higher level of specific heat demand.

For *transport* it is assumed that the conversion-efficiency from fuel to transport-work is increased 2.5 times (from current 15-20% in combustion engine systems to 50% in fuel cell systems). The total efficiency increase is assumed to be in the order of 4 times compared with today's average. For rail and navigation are included increase in efficiency gains of 40% and 25% respectively.

The growth of *energy services*, i.e. heated floor-space, transported goods and people and energy consuming production, is expected to reach saturation levels during the 50-year period of the vision. For the 15 "old" EU-countries, the growth 2000–2050 varies from +40% for use of household appliances to –35% in road transport. For the 10 "new" EU countries is expected higher growth than for EU-15, mainly for service and road transport. For both these sectors is expected a 2.5 times increase.

The energy conversion system should be developed to cater for the changes. The electric grid is likely to increase in importance, because electricity will also be used for transport, directly or via conversion to hydrogen, and some heating will be via the use of heating pumps. The large dependence on intermittent electricity supply makes it necessary to have flexible electricity consumption and energy storages in some form. It is expected that use of current storage in hydropower, pump-storage etc. combined with more flexible consumption for heat via heat pumps

and for hydrogen can provide the necessary regulation at least until 2040. An obvious possible flexibility in power plants is to combine cogeneration plants with heating-pumps. From 2040 there might be need in addition for electricity storages, e.g. as chemical storages. For the "new" EU countries the use of wind power is expected to be less, and the need for electricity, leading to a lower fraction of intermittent supply, and less need for electricity storages.

The vision will lead to *decreasing primary energy demand* as the efficiency in end-use and in the energy conversion system is larger than the increase in demands for heated houses, electric appliances, etc. The vision includes an increasing reliance on electricity, and as an effect the electricity supply is not reduced considerably; but a large part of this is assumed to be used for transportation.

The *reduction of CO_2 from energy use* is expected to follow the 8% reduction target for 2010, followed by a 30-40% reduction in 2020, more than 50% reduction in 2030, and more than 95% in 2050.

The energy efficiency measures are expected to be *cost-effective*, either because they are already cost-effective or because they can become cost-effective if implemented on a large scale. The renewable energy technologies are expected to become cost-effective in general before their main implementation phase. Solid biomass is cost-effective today and it is therefore given priority 2000 - 2020. Wind power is cost-effective today in some sites, while it is expected to become cost-effective after 2010 in most relevant sites (main implementation 2010-2020). Energy crops and small-scale use of solar heating are both expected to become cost-effective after 2010 if the current trends continue (main implementation respectively 2010-2020 and 2010-2040). Solar for district heating and industry as well as photovoltaic power is expected to become cost-effective after 2020.

The replacement of mainly imported energy with renewable energy and energy efficiency will give considerable employment benefits, in particular because most of the solutions are cost effective.

The realisation of the vision will require efficient policies and measures for energy efficiency, renewable energy, and a sustainable transport system. Proven measures already exist for this, including internalisation of external costs with energy taxes, awareness raising, quality and efficiency labelling, minimum efficiency standards, feed-in tariffs for renewable electricity and gas, most energy-related R&D allocated for sustainable energy, land-use planning to minimise transport, etc. If these measures are used in a concerted way in the EU countries for the period until 2050, they can bring about the transition to sustainable energy.

***C**. Sufficient CO_2 reduction without nuclear power is possible in the Nordic countries*. According to *The Nordic Energy Systems Analysis Project* – a project developed by Greenpeace in cooperation with the Danish energy consultant Klaus Illum based on an extended version of Illum's SESAM model, nuclear power in the Nordic area - Sweden and Finland – can be phased out in parallel with achieving the substantial reductions in CO_2 emission necessary to keep the global warming below 2 degree C compared to pre-industrial time. For industrial countries this means reductions in CO_2 and other greenhouse gases of at least 30% in 2020 and 80% in 2050.

The model indicates that it is technically possible to phase out nuclear power in Sweden and Finland within 20-25 years – and at the same time reduce Nordic CO_2 emissions from the energy and transport sector in accordance with both Kyoto-targets in 2008-12 and the more substantial reductions needed in 2020 and 2030. In addition, in 2030 a nearly 60% reduction in Nordic oil use is possible – and 55% reduction in the use of diesel and gasoline in vehicles compared to now.

The assumed phase-in of wind in order to achieve this target is not extremely ambitious, amounting to about 200-400 MW per year in each of the 4 Nordic countries in the next 25 years – with the highest rate in the last 15 years of the period and in 2030 in total 29 GW installed, producing 85 TWh/year. That means e.g. for Denmark that wind in 2015 deliver 35% of the electricity consumption – the same as recommended by the Danish Wind Industry Association in "Vind eller forsvind" - and for all 4 Nordic countries together that wind covers 15% in 2020 – a little more than projected for OECD Europe in Windforce12.

D. *There is no level playing field for power, including renewables, in the EU.* Four Commission benchmarking reports as well as other official sources have revealed distortions, the existence of national and regional monopolies and oligopolies, absence of consumer choice and lack of inter-connectors which is a precondition for real competition. In addition to this, the reports speak of absence of unbundling of production and transmission of power, 75% of electricity subsidies going to conventional power, of Euratom shielding nuclear energy from internal market rules, of complete absence of any meaningful internalisation of environmental costs and power companies acting on both the demand and the supply side in the wholesale market.

Hence, it is premature to call for competition in the renewables power segment at a time of non-competition in conventional power. Many renewable energy technologies, including wind power would already be competitive if they had gotten the same attention in terms of R&D funding, subsidies, building up of monopolistic structures while taking external costs into account. Applying the "polluter pays" principle alone would go a long way to level the currently non-level playing field between polluting and clean energy.

The conclusion is that unless the current distortions in the emerging internal electricity market are overcome, there will be no effective internal renewable electricity market for renewables to compete in. Effective competition in the conventional power market is a precondition for creating an undistorted and well-functioning market for renewable electricity.

Policy Recommendations

III. The organisers of the conference put forward the following **policy recommendations**:

The conference "Energy Intelligence for Europe" shows that energy policy, including nuclear policy, is an important integrated part of the dialogue on the European Constitution, also in non-nuclear countries. Therefore, it is crucial during the period of reflection that the Danish government as well as any other European government develops a political platform on European energy

policies. Such a platform should include adopting a policy, which aims at obtaining a level playing field for renewables in the European Union. As a minimum, renewables should not be put in a less favourable position than other energy sources such as fossil fuels or nuclear power.

Any policy aiming realistically at obtaining a level playing field for renewables and other energy sources in Europe would imply the abolishment or the reform of the Euratom Treaty. In order to achieve this goal, the Danish government and other governments in the European Union should:

(**1**) Join the initiative calling for an inter-governmental Euratom revision conference.

(**2**) Consider a unilateral withdrawal from the Euratom Treaty if it can be established that Euratom reform is not viable in the short or mid-term. The rationale behind this scheme is that the very existence of the Euratom Treaty comprising all Member States is a more divisive political factor than a Euratom Treaty, comprising only a few supportive Member states.

(**3**) Independently of the above-mentioned options explore all possible political mechanisms on the national and European level, including the European constitutional level, aiming at developing and maturing renewable energy technologies.

(**4**) Recognise that all these options should be considered urgent and given a high priority. This would imply that the government includes and at the same time gives high priority to these issues in the dialogue on the European Constitution. The dialogue should involve civil society, the political parties, the academic community, media, NGOs and stakeholders in the industry.

In order to facilitate the achievement of the afore-mentioned goal, national and European parliamentarians from all political parties should cooperate, calling on their governments to act on these recommendations.

INTRODUCTION

I. On Friday, September 23rd 2005, six Danish, Swedish and International NGOs convened an international conference at the Danish Parliament Building Christiansborg: **Energy Intelligence for Europe, *The Euratom Treaty and Future Energy Options: Conditions for a Level Playing Field in the Energy Sector***. The conference was organised by *NOAH – Friends of the Earth Denmark, The Danish Ecological Council, The Danish Organisation for Sustainable Energy,* and also convened by *The Society for Green Technology, The Swedish Anti Nuclear Movement* and *Friends of the Earth Europe*.

The conference had two main objectives: To assist in promoting the initiative of an intergovernmental conference on the Euratom Treaty and to provide the Danish Government with high quality information and analysis to adopt a proactive policy on the future of the Euratom Treaty.

The need of such a policy has been highlighted by the recent rejection by French and Dutch voters of the European Constitution, which has had far-reaching implications all over Europe. Member States will now have to reflect on the consequences of these votes for some time to come. In this period of reflection, a European dialogue is expected to clarify, deepen and democratise the consensus around the Constitution while addressing criticisms.

According to the now frozen EU Constitution, the Euratom Treaty will remain a stand-alone treaty with its own legal personality. It is well known that some members of the Convention were in favour of a comprehensive review of Euratom, but neither the Praesidium, nor the Secretariat, nor the majority of the European Commission agreed on the necessity to abolish or reform it. The predominant view was that this was a complex and technical subject, which was not appropriate for the Convention to deal with. At the Intergovernmental Conference on the EU Constitution, there was no consensus in support of a more extensive debate on Euratom. Hence, the Convention drafted a Protocol making institutional and financial changes to the Euratom Treaty in line with those changes being made in the Constitution itself, seemingly to increase clarity through a new unified structure, integrating or harmonising the Euratom articles with the general Treaty Articles.

Obviously, these developments are of significant interest in Denmark, to its government, its population and to stakeholders in its energy and industrial sector. In the crucial "period of reflection" which has to be put to use in the best possible way, two vital questions must be answered or at least reflected on: *How important is Euratom in the European dialogue and how is the continued and unaltered existence of the Euratom Treaty going to influence the perception and reception of the European Constitution and the development of the European Union in the future?*

With respect to the first question: Nuclear power represents one third of the electricity production in the EU[2] and it is well known that many people expect that among others its alleged greenhouse effect neutrality might give it a renaissance. However, almost half the EU Member States, including

[2] The production of nuclear power in Europe has never been higher: 32% of consumption in 2003, compared with 2.4% of the electricity produced by wind power.

Denmark, have chosen not to develop nuclear power and some of these Member States are now phasing out their nuclear power programs.

In this context, two conflicting hypotheses present themselves. The first one is this: The nuclear industry and renewables co-exist in perfect harmony and if they do not, they will have to do so in the future, because they constitute the only alternative to combustion of coal, oil and gas. They are, so to speak, part of the same package.

The second hypothesis is the following: If it can be argued that co-existence between a rapidly developing renewables industry and a slowly fading nuclear industry is impossible, then a conflict of interest between nuclear and non-nuclear countries in the EU first and foremost manifests a clash between these competing industries. If this assumption is true, it would imply the existence of a correlation between the share of renewables in a country's electricity production and the emphasis it puts on the development on renewables and its interest in obtaining a level playing field for RES in the European electricity markets. This would among others necessitate a closer look to be taken at the Euratom Treaty. The question is supposedly this: Is it fair to say that the Euratom Treaty – at least in some respects – distorts the European electricity market? And what are the issues that the non-nuclear and the nuclear-phasing out countries in the EU have to deal with concerning European nuclear policies?

The increasing attention paid to this second hypothesis has resulted in the promotion of a Treaty on Renewable Energy and Energy Efficiency (EURENEW), a concept, which has been developed by among others the European Association for Renewable Energy (EUROSOLAR) and the European Forum for Renewable Energy Sources (EUFORES)[3].

With respect to the second question: It is well known that one could say – and it has been stated at several occasions - that the European Union has "been built on energy"[4]. Not only is energy one of the main pillars of the EU construction, two of the three founding Treaties – the Treaty establishing the European Coal and Steel Community and the Euratom Treaty – focused on energy. Nothing seems to imply that the significance of the energy sector in Europe has diminished or will do so in the future. Electricity will continue to play a large and increasing role in Europe's energy future, with half of the projected increase in gas demand expected to come from electricity. The economic stakes are enormous as the volatility of oil and gas prices is continuing to inflict a multi-billion Euro drain on the global economy, including the European economy. In two decades – with no change of direction - Europe will be importing 70% of its energy. This import amounts to 50% today.

As a consequence of this, a general perception in Member States that the European electricity market is unfair even on the constitutional level could have a negative impact on popular acceptance of further European integration and perhaps even undermine EU's role as a global leader concerning initiatives on CO_2 emissions reduction, because the competition distortion hurts the industries whose development are of paramount importance for the possibility of CO_2 reduction. The perception of unfairness and the effects of competition distortion favouring nuclear power could also have a negative influence on the willingness of Member States to make the necessary investments in energy efficiency and energy conservation. Both these possibilities could have seriously negative environmental and economic consequences.

[3] For further information on the concept of EURENEW, please see the Annex of this report.
[4] E.g. see the presentations of Nina Commeau-Yannoussis and Christian Kjaer.

II. One could say this conference set out to answer the first of the questions mentioned above in order to make an answer to the second question possible. Thus, it focuses on the following crucial issues:

(**A**) *Existing legislation in the European nuclear field both on the constitutional level (the Euratom Treaty) and with respect to the various directives*. This applies both to an inter-governmental Euratom revision conference as proposed by Austria, Ireland, Hungary, Sweden and Germany and to the competition issues described below. Another approach if Euratom reform is not viable in the short or mid-term could be to focus on the right to unilateral withdrawal from the Euratom Treaty for one or more Member States, although this would mean that the basic structure of the Euratom Treaty could remain intact.

(**B**) *Attention directed to Euratom's promotional rather than its regulatory aspects*. Allegedly the Euratom Treaty contradicts both existing EU-treaties and the new Constitution regarding a common market without competition distortion. Umbrella organisations of renewable energy in Europe, e.g. *European Renewable Energy Council (EREC), European Wind Energy Association (EWEA), European Renewables Energies Federation (EREF)* and *EUROSOLAR* have claimed for a long time that free competition in the European electricity markets is a myth and that it – as things are now - will not be implemented in 2007 either, when market liberalisation is expected to give all consumers the ability to choose their energy supplier. According to these organisations, existing distortions favour the incumbent energies and disfavour new entrants.

(**C**) *Whether Euratom's loan facility and the proposal to raise the Euratom loan ceiling are appropriate*. Since 1977 around €3.2 billion worth of financial support for nuclear power has been awarded by the Euratom's nuclear loan facility. Although the Euratom Loan budget is relatively small it is important for the completion of nuclear power projects. The financing of new nuclear reactors is complicated and risky, due to the large construction costs, long lead times and fluctuating market price for electricity. Consequently, the financial involvement of the EU is used to encourage other financiers and alleviate public concern. In 2002 the European Commission put forward a proposal to raise the Loan ceiling by a further €2 billion to a total of €6 billion[5]. However, the Council of Ministers was unable to reach a decision on the issue and the legislation has not progressed.

(**D**) *Whether the promotion of European nuclear power is at the expense of research, development and production of renewables in the EU if at all*. In April 2005, the European Commission published its draft proposal for the 7th Framework Programme (FP), which allocates research and development funding across a whole range of sectors. The Commission proposal is remarkable in that firstly, the research and development budget is separate from that of other energy programmes, which effectively means that nuclear is "protected" from the other debates about how the limited funds for energy R&D should be allocated, and secondly that there is no Parliamentary co-decision of the Euratom programme, only consultation.

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[5] *Proposal for a Council Decision amending Decision 77/271/Euratom on the implementation of Decision 77/270/Euratom empowering the Commission to issue Euratom loans for the purpose of contributing to the financing of nuclear power stations*, COM/2002/0457 final, http://europa.eu.int/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&type_doc=COMfinal&an_doc=2002&nu_doc=457&lg=en

In the proposal, both fission and fusion is proposed to receive 60% of the total funds allocated to energy technologies. The Joint Research Centre and nuclear fission research programmes are expected to focus on radiation protection, nuclear waste management and the development of new reactor designs (including the Generation IV reactors). Fusion research is set to receive a considerable boost in its funding, an increase from roughly €200 million per year over the years 1995-2006 but rising to €600 million per year at the end of the FP. This is in anticipation of the construction of the ITER (International Tokamak Experimental Reactor), which is to be located in France.

(**E**) *Whether the funds to finance decommissioning activities and the handling of nuclear waste can be spent to distort EU's liberalised electricity market*. It can be argued that this can only be prevented if the funds controlled by the nuclear operators are separated from their other financial resources. Utilities in Europe have a different approach to the management of their waste management and decommissioning funds and as the European Commission notes in a document reviewing this issue, "this situation (lack of uniformity of decommissioning policies) could lead to distortion and discrimination between now competing nuclear electricity producers from different Member States. Decommissioning costs are clearly seen as part of the electricity production costs. They may not be cross-subsidised from the transmission activity nor be directly subsidised via state aid"[6].

III. All the written speeches and presentations at the conference have been published in their entirety on the conference website, as well as audio files covering the speeches and presentations. The basis of the summaries of the speeches and presentations in this report is a mixture of what was said, i.e. what originates from the audio files, and what was presented, i.e. what originates from the written presentations. Full transcripts of the morning and afternoon debates have been published on the conference website. Also, the audio files covering the debates can be found on the website.

IV. *The conference was made possible by funding from the Danish Board for EU-Enlightenment, the First of May Foundation and Plum's Ecology Foundation. We thank them for their generous support.*

We would like to express our thanks to the speakers, presenters, debaters, moderators and chairs, who made this conference such an informative and successful event.

Also, we want to say thank you to Niels Henrik Hooge and Mycle Schneider who more than anyone else were involved in the development of the conference concept. Without their efforts and contacts the conference would not have become the valuable event it turned out to be.

We wish to express a further special thanks to Niels Henrik Hooge who has made an outstanding contribution in the long process of planning and carrying out, as well as the documentation and reporting of this conference.

[6] *Nuclear Safety and the Environment, Decommissioning of nuclear installations in the European Union*. Supporting document for the preparation of an EC Communication on the subject of decommissioning nuclear installations in the EU, EUR 18860 1998, p. 30.

Many other people have been involved in developing and organising the conference. They too deserve our thanks.

They are:

- the many people from NOAH – Friends of the Earth Denmark, who took upon them to carry out many practical jobs on the day of the conference;

- NOAH's accounts group and NOAH's Energy group, especially Palle Bendsen and Henning Bo Madsen.

- The Danish Parliament's Users' Centre and Niels Erik Fagerberg from The Danish Parliament's Library, Archives and Information Service,

- and finally Stig Melgaard, Bjarne Olesen and Miles Goldstick who were webmasters for the conference website.

NOAH-Friends of the Earth Denmark, Energy Group

Kim Ejlertsen

The Danish Ecological Council

Uffe Geertsen

The Danish Organisation for Sustainable Energy

Marianne Bender

Summaries of the morning programme's speeches, presentations and debate

Soeren Voehtz; The Ministry of Foreign Affairs of Denmark

1. Soeren Voehtz from The Ministry of Foreign Affairs of Denmark gave the **welcome speech**, stating that he was very honoured and pleased to be invited on behalf of The Ministry of Foreign Affairs to participate in the opening of the conference He especially welcomed the conference participants who had come from afar, wishing them an enjoyable stay in Copenhagen, also pointing out that Copenhagen in many ways is a well-suited place for the conference, considering the symbolic view one had from the city's shores on a clear day. One would especially have an excellent view of the offshore wind power farm located at the middle of Oeresund and also of Svanemoellevaerket – a fifty years old, but recently modernised power plant using natural gas – and if one looked a little further to the shores of Sweden, one would be able to get a view of the now closed Barsebaeck nuclear power plant. This view might be an inspiration for the discussions and analyses that would take place today.

Soeren Voehtz also pointed out that a look at the state of world affairs would show us that discussing and analysing the options between different energy sources is now more relevant than ever. High growth in countries like China and India has been coupled to an immense increase in energy demand, giving us all a clear indication of the long-term challenges we are facing. Recent events such as the in all aspects disastrous hurricane Katrina and the unfortunately now to be feared hurricane Rita and their possible consequences for energy supply is another example of the importance of discussing and analysing all energy sources and more importantly their options. Hence, the discussion should include sources but also consumption patterns and not to be forgotten – energy efficiency - elements that Soeren Voehtz was sure would be included in the work of this conference. Technology is in constant progress and this calls for a continuous reflection on how we address and choose between the energy options before us.

This could be exemplified by some recent but very different energy developments that show us how fast changes occur and the span of them. One is the movement towards affordable sufficient windmills that are catering for single households in an affordable way and as a decentralised energy source. Another is the breakthrough in the international negotiations with the agreement to start the construction of the experimental fusion plant, ITER, in Cadarache in France. A third could be Danish researchers' successful development of the hydrogen pill, opening up new avenues for the storage of energy. Also taking a look at the political realities in Europe with regard to nuclear power, one would on one hand see a number of countries, including Denmark, defending a non-nuclear energy policy, on the other hand one would see a number of countries where one could say that there is a revival of nuclear power. The revival is often supported by arguments reflecting on the CO_2 national impact of nuclear power. The examples underline that we must also frequently

revisit the considerations on whether all aspects of the political framework for energy supply is still optimal and valid and whether we profitably can try to change the scenery.

Soeren Voehtz concluded his welcome speech with the following statement:

"Most of you will be aware of the Danish government's sceptical approach to nuclear power. You will also be aware of the – should I say – hesitant position taken with respect to reform of the Euratom Treaty in the course of the discussions on the Constitutional Treaty. Let me however underscore that I have no preconceived views on the Euratom Treaty. Let me rather emphasise that I am confident that today's highly qualified speakers and participants will come up with new ideas with new angles, with new arguments that could serve as a basis for further consideration to the benefit of all of us. This makes me look forward to our follow-up discussions. Hence, I do not only welcome you as participants to Copenhagen, I also welcome the initiative taken by today's conveners. I wish all of you a fruitful and interesting day".

Dr. Dörte Fouquet; European Renewables Energies Association

2. Dr. Dörte Fouquet who is an attorney from the *European Renewables Energies Association (EREF)* gave a presentation on **"The Legal Perspective: The Euratom Treaty and the new Constitution"**. She started her presentation by describing the Euratom Treaty as carrying "the stigma of an undemocratic, outdated alien in the world of the liberalised energy market", hindering the development of an open sustainable energy market in Europe. The organisation of nuclear power on the basis of the Euratom Treaty and the Member States' own national legislation leads to the behaviour of closed shop policy with disturbing consequences for a democratic society in Europe.

She then touched on the subject of the drafting of the European Constitution, which she described as having elements and initiatives for a complete overhaul of the Euratom Treaty in the beginning, but from the majority of interest it was used to revitalise the nuclear interest in Europe. Neither the Praesidium of the Convention to the Treaty, nor the Secretariat, nor the majority of the European Commission were willing or agreed on the necessity to abolish or at least reform the Euratom Treaty. They have simply sought to preserve and to re-justify it, following the implementation of the Maastricht, Amsterdam and Nice Treaties. The official philosophy, if one can find such, was just to increase clarity through a new unified structure, integrating or harmonising it in one way or the other the Euratom articles with the general Treaty Articles.

According to the draft EU constitution, Euratom now is supposed to remain a stand-alone treaty with own legal personality. A so-called sunset clause approach of those who want to get rid of it has not succeeded yet. But at least the attempt to merge Euratom with the Constitution was also defeated. In Dörte Fouquet's view, it is better so. Now there is time to analyse the risks and costs of a phasing-out under different alternatives, be it via a unanimous procedure within the inter-governmental conference rules or be it by an approach, that some member-states will leave the Euratom Treaty in accordance with relevant international rules.

According to Dörte Fouquet, the key factor is however, that Euratom, has remained stable and unchanged even though it has had some changes in its articles. The basic distinctions between the legal personalities of the different communities are still valid, because there is up till now not one single European community.

In Dörte Fouquet's opinion, Europe lost clarity in its energy policy with Directive 6962 of the Parliament and the Council, 19 December 1996, regarding common rules for the common market in the electricity field. Europe created after long years of discussion and preparation the opening towards a single market in energy. No energy source has been legally exempted from the application of this directive. The directive did not create a separate market for nuclear power, but the nuclear sector uses the Euratom Treaty and specific national legislation to maintain and create a market in a market and deeply disturb the internal market for energy by a dramatic concentration process of market power and oligopolistic structures, especially coming from France and Germany and in Central Europe, with consequences for energy security and energy independence in the whole Europe. The undemocratic mode, in which nuclear energy policies are imbedded in Europe, leads to a situation where openness and clarity and a level playing field are not applied to the necessary democratic and economic extent.

The most basic problems in this respect are: The non-integration of co-decision and control right by the European Parliament in all basic questions related to Euratom, especially nuclear research structure and budgeting, the management of lavish reserve funds for future dismantling of nuclear power stations in the hands of nuclear power operating utilities and the generous cap of responsibility in case of nuclear accidents.

The European Parliament and also the European Commission often underline the importance - in order for the internal energy market to function - of appropriate legislation requiring the establishment of funds for decommissioning and waste management to ensure the availability of the funds in due time and to ensure that funds are not used for improper activities in that sense.

In Dörte Fouquet's view, the Euratom Treaty – which dates back to 1958 – is a problematic dinosaur, because it has a clear priority in favour of only one power industry in Europe. The Treaty starts in a way that recognises that nuclear power represents "an essential resource for ensuring the expansion and invigoration of production and for effecting progress in peaceful achievement" and with a conviction "that only a common effort undertaken without delay can lead to achievements commensurate with the creative capacities of their countries".

Almost fifty years ago the parties of the Treaty were convinced and resolved that the development of a powerful nuclear industry, which would provide extensive energy resources would lead to the modernisation of technical processes and contribute through its many applications to the prosperity of their people.

The main task of the Euratom Treaty is laid down in Article 1: "It shall be the aim of the Community to contribute to the raising of the standard of living in Member States and to the development of commercial exchanges with other countries by the creation of conditions necessary for the speedy establishment and growth of nuclear industries".

Since then a lot has happened in the world of energy and competition in an ever-enlarging Europe, which makes this Treaty an anachronism and a vehicle for vested interest of concentrated power in a liberalised market, which is crippled by privileges given to the nuclear industry. Apart from this economic tool given by the Euratom Treaty and its extremely generous funding, the world has faced a multitude of nuclear incidents with Chernobyl as its most gruelling consequence. The dual use of nuclear power – it is also used for military purposes – constitutes a daily threat.

Many countries in Europe do not have nuclear power or have decided to phase out their use of nuclear power, replacing this with and a new sustainable energy-efficient structure, based on highly efficient technology without nuclear and increasingly on the replacement of fossil fuels and nuclear by renewable energies and are encouraging the independence of power supply on the local, regional and state level.

The German law on the peaceful use of nuclear energy and the protection against the risks of nuclear energy in its wording from 22 April 2002 proscribes under Article 1 that the use of nuclear energy for commercial production of energy has to be ended. This means that 45 years after the birth of Euratom, a complete change of energy policy has occurred in this country and I would say in many other countries, which have decided to follow the same path.

Countries such as Denmark do not rely on nuclear energy themselves, but are provided with electricity by many nuclear power stations in neighbouring countries. The countries without nuclear power as well as countries, which have recognised the anti-competitiveness and the non-sustainability of Euratom's structure have an interest in ending Euratom and to integrate the necessary safety conditions in the Treaty in the general EU Treaty, be it the new Constitution or just an amendment to the existing EU Treaty.

In February 2003 a submission by Convention members for the Constitution was put forward, which called for the abolishment of the special economic zone that Euratom has created and to respect the principles of fair competition and create a level playing field for the different energy sources, thereby ceasing the undue influence of nuclear power compared with its rivals. The reason for this initiative was the electricity market liberalisation and the democratic deficit in this field.

According to Dörte Fouquet, we need a phasing-in as well as a phasing-out, which is currently not happening. To her knowledge, the only concrete action has been the statement of several countries such as Austria, Germany and Sweden, asking for an intergovernmental conference of the Euratom member states to start discussion on what to do and how to do it.

The German government for example – if one goes into the webpage of the German government itself – outlines the following: "The purpose of the EURATOM Treaty as adopted against the historical background of the 1950s, namely the promotion of nuclear energy in the European Atomic Energy Community, does not automatically oblige member states to promote the use and development of nuclear energy as a commercial energy source within their territories. It is rather for each member state to decide whether and to what extent it wishes to use nuclear energy, as the technology advances. The EU Commission has also come to this conclusion: "It is generally thought that it is up to each member state to decide to introduce or maintain nuclear power as an energy source." The German Government's policy on the phasing-out of nuclear power and the

"consensus" reached with the energy industry on 14 June 2000 are thus not at odds with the Euratom Treaty[7]".

According to Dörte Fouquet, this is quite a defensive stance and not illuminating or taken on promises from two years ago, where Germany also subscribed to encourage a conference of the Euratom states on phasing out of nuclear. Some opinion tries to suggest that Euratom is as eternal as is the Bible for Christianity. They based their opinion on Article 208 in Euratom, which stipulates the following: "This Treaty is concluded for an unlimited period". But such a conclusion is legal nonsense. A treaty without exit date can under conditions always be modified or ended. The Euratom community can via the organisation and e.g. management of an inter-governmental conference try to find a unanimous solution to end the treaty. Realistically, one should try to do that as a member state, focusing on competition danger, but it is a difficult way. It would be helpful if member states acted together - those member states, which agree that Euratom should go away. In a way, they should in a parallel fashion opt for a way following the procedure and rules under the international common law in combination with the Vienna Convention on International Treaties. Since Euratom has no specific rules, the Treaty has to be ended under this limit in the context of international law and procedures.

According to Dörte Fouquet, there is a unanimous view in legal terms that such a treaty can be ended or phased out under specific conditions. However, there is no unanimous view whether these conditions have been met.

The first reason lies in the nature of the treaty in question. It is outlined in Article 56 of the Vienna Convention on the Law of Treaties[8]: "*Denunciation of or withdrawal from a treaty containing no provision regarding termination, denunciation or withdrawal:* (1) A treaty which contains no provision regarding its termination and which does not provide for denunciation or withdrawal is not subject to denunciation or withdrawal unless (a) it is established that the parties intended to admit the possibility of denunciation or withdrawal; or (b) a right of denunciation or withdrawal may be implied by the nature of the treaty".

The Vienna Convention dates back from 26 May 1969 and is therefore younger as the Euratom Treaty. It does not have the effect to go before its own appearance. The wording of the Treaty can nevertheless be used, because it repeats a general rule in international law, which has been established long before the Vienna Convention. So a country such as Germany or Denmark should look at the energy policy in relation to the philosophy and the objectives of the Euratom Treaty in the late fifties and could list a table a of conditions, which could lead to a withdrawal right on the basis of the nature of the Treaty.

The second approach to phase out and to ask for the right to withdrawal, which is a unilateral approach, is to combine forces with several likeminded nations. But that would mean that the torso of the Euratom Treaty would remain in force. This is a fundamental change of circumstances, the second normally known international term and it also reflects a long-standing internationally accepted ground for phasing out an international commitment.

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[7] Statement by the German Government on the webpage: http://www.auswaertiges-amt.de/www/en/aussenpolitik/vn/nuklearpolitik/euratom_html

[8] http://www.un.org/law/ilc/texts/treaties.htm

In the Vienna Convention, this is reflected in Article 62, which outlines the detailed provisions for such fundamental change of circumstances[9]. In this article a lot of circumstances can be found, which could lead to the conclusion that nuclear power is no longer an indispensable source for the development and the encouragement of for example the Danish or the German industry and economy. There are also many other things one could look at in order to encourage countries to take action.

Dörte Fouquet ended her presentation by emphasising that the European countries should finally make their homework by reflecting on, what consequences Euratom has for the economy:

"At least, the discussion should be opened and countries such as Denmark, Austria and Ireland should press for example Germany to come to terms. If the current situation is apart from what feelings you have towards nuclear, one should realize that there is an obligation of Member States to be loyal towards European law. Since the directive for the liberalisation of the energy market has come into force, the time has also come, where the phase-out process should start".

Nina Commeau-Yannoussis; European Commission Directorate-General for Energy and Transport

3. Nina Commeau-Yannoussis, Head of Unit of Energy Policy and Security of Supply, European Commission Directorate-General for Energy and Transport, gave a speech on **"The role of Euratom in European Energy Policies"**. She started her speech by emphasising that the opinions she expressed were her own and not the official point of view of the European Commission. The Commission's Head of Unit of Energy Policy and Security of Supply then established that energy is one of the main pillars of the EU construction. Two of the three founding Treaties – the Treaty establishing the European Coal and Steel Community and the Treaty establishing the European Atomic Energy Community- Euratom – were focused on energy. The Euratom Treaty aimed originally at promoting the development of nuclear energy as an alternative safe energy source within Europe. In the 1950s, the perception of the scarcity of conventional energy sources in Europe was high. Coal production was at a peak and seemed to have hardly any possibility for growth. Hydropower had its geographical limitations and the 1956 Suez crisis had brought into focus the risk of an ever-increasing dependence on oil sources outside Europe.

[9] Pursuant to Article 62 (*Fundamental change of circumstances*), "(1) a fundamental change of circumstances which has occurred with regard to those existing at the time of the conclusion of a treaty, and which was not foreseen by the parties, may not be invoked as a ground for terminating or withdrawing from the treaty unless (a) the existence of those circumstances constituted an essential basis of the consent of the parties to be bound by the treaty and (b) the effect of the change is radically to transform the extent of obligations still to be performed under the treaty. (2) A fundamental change of circumstances may not be invoked as a ground for terminating or withdrawing from a treaty (a) if the treaty establishes a boundary or (b) if the fundamental change is the result of a breach by the party invoking it either of an obligation under the treaty or of any other international obligation owed to any other party to the treaty. (3) If, under the foregoing paragraphs, a party may invoke a fundamental change of circumstances as a ground for terminating or withdrawing from a treaty it may also invoke the change as a ground for suspending the operation of the treaty", http://www.un.org/law/ilc/texts/treaties.htm

It was also clear that massive investment would be required to fund the development of a complete nuclear fuel cycle, well beyond the financial means of individual European States. In this context, the six founding States joined together to form the European Atomic Energy Community.
According to Nina Commeau-Yannoussis, much has happened since 1958. The European nuclear industry has developed into one of the most prominent in the world. At the same time, new Member States have joined the European Communities through five waves of accession. Some of them have little or no interest in nuclear energy. And, some Member States, which previously made the choice for nuclear energy for electricity generation, then decided on moratoria or phase-out of nuclear energy.

However, the perception of nuclear energy has changed in the recent years. The debate about security of energy supply in the European Union and the issue of greenhouse gases emissions have given rise to a new interest in nuclear energy. The current levels of crude oil prices (more than 68 $/barrel) and of fossil fuels in general provide an additional reason for keeping the nuclear option open.

Whatever the choices of Member States, their decisions to abandon nuclear energy (Belgium and Germany) or to give a new impetus to their programmes, like in Finland and in France, the production of nuclear electricity has never been so high (32 % of consumption in 2003, to compared with 2,4 % of the electricity produced by windmills). Moreover, without nuclear energy, the Union would not be in a position to respect its commitments to decrease greenhouse gases emissions in the framework of the Kyoto Protocol.

Euratom played a significant role in the development of a civil nuclear industry in Europe and still has a major contribution to make to European Energy policies, especially in two main fields: (1) The protection of European citizens and (2) the diversification of energy supplies.

(1) With respect to *Euratom and the protection of European citizens*, Nina Commeau-Yannoussis stressed that the aim of the European Atomic Energy Community was to contribute, by the development of nuclear energy, to the rise in the standard of living in the Member States and to the development of trade with other countries. If the Preamble of the Euratom Treaty now seems somewhat antiquated in its active promotion of this energy source, it must be remembered that implementation of the Treaty has enabled binding control of nuclear activities in the areas of radiological protection, supply of nuclear fissile materials and nuclear safeguards.
In this respect, one of the main achievements of Euratom is the protection of the European population from the risks linked to the use of nuclear energy and, more generally, the use of nuclear materials for civil applications. Protection of European citizens has always been one of the core objectives of the Euratom Treaty.

Nina Commeau-Yannoussis said that it was not her intention to give an overall presentation of the Euratom Treaty, in stead she would concentrate on the Euratom policies which have contributed, since the signing of the Treaty, to the protection of European citizens by means of research, nuclear safeguards/non-proliferation and health protection.

Research (Chapter 1): The aim of the Euratom Treaty is to promote within the Community the development of an alternative energy supply source by developing knowledge and the means

needed to exploit nuclear energy for civilian purposes. To this end, it gives the Community the tasks of developing research and ensuring the dissemination of technical knowledge.
Most of the nuclear research at Community level is undertaken as part of the Euratom Framework Programme. The guidelines for research have varied over time. Today, they concentrate mainly on environmental concerns, notably waste management, radiation protection and nuclear safety.
Thus, under the sixth Research Framework Programme for 2000-2006 the European Union is committed to supporting nuclear research and especially to improving nuclear safety and waste management.

Nuclear Safeguards (Chapter 7): Nuclear safeguards are a set of measures performed by the controlling authority to verify that nuclear materials are not diverted from their intended uses.
Since 1958, the European Commission has been engaged in nuclear safeguards controls in nuclear installations throughout the European Union. The basis for these controls lays in Chapter 7 of the Euratom Treaty. This Chapter sets up a comprehensive, very stringent system for safeguarding nuclear materials that is unique in the world.
The body of Euratom inspectors contributes to ensuring that EU Member States comply with their international obligations under the regime of nuclear safeguards. Nuclear safeguards represent the most intensive field of co-operation between the Community and the International Atomic Energy Agency.

The high level of expertise accumulated by the Commission in the field of nuclear safeguards has contributed to a climate of confidence not only among the Member States of the European Union but also with our partners throughout the world. Euratom safeguards therefore have largely contributed to ensuring the security of supply of nuclear materials to the Member States by giving firm guarantees concerning civilian use of nuclear materials in the Community.

Health protection (Chapter 3): The Community plays an important role in protecting European citizens against ionizing radiation. Since the signing of the Treaty in 1957 the Community has adopted a wide range of legislation, covering the protection of workers (in the nuclear industry, hospitals, research, other industries), the general public (from discharges of nuclear installations, fall-out from Chernobyl) and patients.
The main provisions are laid down in Basic Safety Standards, first established in 1959 and regularly updated in the light of scientific knowledge and operational experience. The scope of the Standards has evolved with time and now covers, for instance, natural radiation sources (radon, exposure of air crew to cosmic radiation, etc.).
The Euratom Treaty also confers important powers upon the Commission with regard to levels of radioactivity in the environment. Member States are obliged to monitor levels of radioactivity and to report to the Commission. They also have to report on any planned release of radioactive waste.
The Commission has long held the view that health protection encompasses the concepts of radiation protection and nuclear safety. This was confirmed by a ruling of the European Court of Justice in 2002.

In this particular field, the Commission has proposed two major legal initiatives in the revised "nuclear package" adopted on 8 September 2004. These two initiatives aim to endow the European Union with legally binding legislation to ensure that Member States maintain high levels of safety in nuclear facilities and in the management of radioactive waste. Such rules will enable the Community to ensure a high level of nuclear safety within the enlarged European Union for the

benefit of Europeans citizens. Unfortunately, it has not yet been possible to reach the qualified majority in Council necessary to adopt these two proposals.

However, the Commission still hopes that these proposals will be adopted in the near future. Nuclear safety and radioactive waste management are two major issues, which require appropriate solutions, irrespective of national policies on nuclear energy.

Concerning *Euratom's contribution to the diversification of energy supplies*, Nina Commeau-Yannoussis established that Europe has long been dependent on imported energy. However, the recent decline in both domestic gas and coal production has also led to a significant increase in import dependence. Some of this increase is unavoidable. Nevertheless, dependence on external countries heightens the risks to the European economy from the energy sector.
A number of policy responses are required, focusing on action on the demand side and on managing the risks associated with external supply. One of the policy responses lies in the development of our internal sources of energy, such as nuclear and renewables. Europe's future prosperity will depend on its ability to diversify its energy sources.

Today nuclear energy provides more than a third of EU electricity. It is a stable source of energy independent of price fluctuations such as have recently affected the oil and gas markets. Nuclear energy is also free from CO_2 emissions. It prevents the emission of about 300 M tonnes CO_2 annually, equivalent to about half of the emissions produced by the Community car fleet.
With its Green Paper "Towards a European strategy for the security of energy supply", published in November 2000, the Commission has encouraged a healthy debate about the role of nuclear energy in serving Europe's needs.

However, the option of using nuclear energy to generate electricity is a matter for national governments within the EU. The European Union does not rule out any choices among energy sources.

In this respect, the Euratom Treaty provides a valuable framework for the controlled use of nuclear energy in Europe, thus contributing to the acceptability of the nuclear option in the public. Euratom also plays a major role in encouraging research and development on new technologies and on nuclear reactors for the future. One of the main objectives of the Euratom Framework programme is to increase security of supply of energy by greater diversification of sources, keeping the nuclear option open for all those Member States who wish to use it.
The major resources of the 6th Research Framework Programme (2002-2006) are allocated to the fusion programme, which will form a very important contribution towards the International Thermonuclear Experimental Reactor (ITER). This experimental reactor will be built on the French site of Cadarache, which was the European Union's candidate site. Thermonuclear fusion presents almost limitless possibilities for the longer term, but several obstacles still stand in its way to being a new energy source.

The European Union is now envisaging the adoption of new initiatives linked to the security of energy supply. Since 2000, the political and economic context has changed substantially in Europe and worldwide. The climate agenda has gained in importance, thanks, in particular, to the European Union greenhouse gas trading scheme, which was adopted to help EU Member States meet their commitments under the Kyoto Protocol.

Nuclear energy undoubtedly will continue to play a role in fighting the growth in greenhouse gas emissions, provided that safety and security is ensured.

On the subject *what future for the Euratom treaty?* Nina Commeau-Yannoussis drew the following conclusion:

"The core provisions of the Euratom Treaty have remained unchanged since 1958 and have not been modified by the last Intergovernmental Conference. The only amendments which would be made to the Euratom Treaty by the draft Constitutional Treaty are adaptations to new rules which would be established by the Constitution, particularly in the institutional and financial fields. More important, it was decided that Euratom should remain a separate Community.

This situation is not seen as very satisfying by some of the EU Member States and parts of public opinion. The future of the Euratom Treaty has been openly questioned; in this context, some would favour the idea of convening an Intergovernmental Conference to revise the Euratom Treaty. This point of view was not shared by the Intergovernmental Conference in 2004. An isolated revision was not considered as appropriate, the Euratom Treaty being part of the European project as a whole and of European energy policies in particular.

Contrary to a common misperception, it should be noted, the Euratom Treaty is well balanced, containing strict provisions restraining, regulating and controlling all civil nuclear activities, whether linked to energy generation, industrial or medical use. Member States, which are not in favour of nuclear power nevertheless recognise the merits of the Treaty.

Euratom Agreements with third countries and international organisations extend the Community's responsibility in the non-proliferation field. The Community can take pride in having the world's best control and non-proliferation systems.

Negotiations for the 2004 enlargement have demonstrated that the nuclear question is as important as ever. The Accession Treaties contained specific provisions regarding nuclear safety and commitments to close eight nuclear reactors which were then in service in three of the new Member States".

First keynote speech: Peter Brazel; The Irish Department of the Environment, Heritage & Local Government

4. The possibility of Euratom reform was the main topic of **the conference's first keynote speech**: **"Euratom Treaty Reform and Prospects for a Euratom Revision Conference"**, delivered by **Peter Brazel** from the Irish Department of the Environment, Heritage & Local Government.

After noting that the views expressed in the presentation are his own personal views that should not be regarded as the official position of the Irish Government, Peter Brazel outlined the historical background of the European Atomic Energy Community.

According to him, this was useful because Euratom is very much a creature of its time and while it is common practice to refer to the current EC Treaty and the Euratom Treaty very much in the same breath, their aims, policies, philosophies and subsequent paths of development are not the same.

Although the two "Treaties of Rome", establishing the European Economic Community (EEC) and the European Atomic Energy Community (EAEC), known as Euratom, were signed on the same day in March 1957, the philosophy behind them was very different. While the EEC Treaty – now the EC Treaty - is based on free market principles, the objective of the Euratom Treaty was to encourage the development of a European civilian nuclear industry. In order to achieve this, the Euratom Treaty invested considerable centralised powers in the Commission.

Unlike the EC Treaty, which has developed significantly since its signature, the Euratom Treaty has not been substantially modified. Nevertheless, since 1958, the European nuclear industry has developed into one of the most prominent in the world. At the same time, the number of States party to Euratom has significantly increased following five waves of accession.

According to Brazel, there was another important distinction to be drawn between Euratom and the other Treaties. This concerns the absence of any requirement for the Council to formally consult the European Parliament on a whole range of issues relating to different articles of the Euratom Treaty. The development of the EU Treaties has continually increased the role, power, and influence of the European Parliament, by the introduction of co-decision, and the assent procedure for international agreements. Euratom, however, has remained stagnant carrying a considerable "democratic deficit".

Hence, the Euratom Treaty has not kept pace with or evolved to address the substantial emergence of public concerns in relation to the negative public health and environmental impacts of economic development in general and more particularly in relation to the nuclear industry itself.

It is in this context that the future of the Euratom Treaty must be assessed. This leads Brazel to conclude that "Euratom has not benefited from the continuous assessment and evolution of the EU Treaties which has better placed the EU to address the modern needs, demands and norms of Europe in the 21st Century".

He then went on to outline the Irish government policy on this subject:

In the Convention, which framed the European Constitution, some members were in favour of a comprehensive review of the Euratom Treaty, while others clearly opposed any change. The view taken by the Praesidium, which was not challenged by most Convention members, was that this was a distinct, complex, and technical subject and not appropriate for the Convention to deal with.

At the Inter Governmental Conference on the EU Constitution, while Ireland and some other Member States proposed a more extensive debate on Euratom, it was clear that there was no consensus in support of this. Therefore the Convention simply drafted a Protocol making institutional and financial changes to the Euratom Treaty in line with those changes being made in the Constitution proper.

In an attempt to keep the proposal alive, Ireland, together with Germany, Austria, Hungary and Sweden made a Declaration noting that the core provisions of the Euratom Treaty have not been

substantially amended since its entry into force, and need to be brought up to date. The Member States called for an Inter Governmental Conference on Euratom to be convened as soon as possible. The Irish Government would have favoured an extensive review of the Euratom Treaty leading to a significant updating of its provisions and it has made clear that this continues to be its position.

What are the trends in the current political landscape?

According to Brazel, the rejection by French and Dutch voters of the European Constitution in their recent referenda clearly has had far-reaching implications for Europe and is obviously a serious setback.

The EU will have to reflect on the implications of the French and Dutch votes. The message sent from these voters is addressed not only to their Governments, but also to all of the members of the European Council. While the way ahead is not clear, it is only through collective action based on the Treaties and a commitment to the people of Europe, that a collective and successful response can be made to the profound concerns for the future expressed in the negative votes in these two founding members of the Union.

In this environment there will be a need to focus on what unites us at EU level, not what divides us. In looking forward, there will also be a concentration on how much the Union has achieved to date and it is clear that the European Union has served its populations well by building a Europe which is significantly better than the sum of its individual parts.

According to Brazel, the implications for Euratom renegotiation would have to emanate from a deliberate and careful period of reflection by all EU member states. E.g., the Irish Government is expected to publish a white paper on the European Constitution shortly. In relation to Euratom, he expects it will again reflect the existing Government policy referred to earlier.

However, one must take note of the fact that amendment of Euratom will require unanimity. This is an important provision that allows every Member State, including Ireland, to defend its interests to the full. It also means that it is not possible to amend or revise the Euratom Treaty without unanimous support, including from those Member States with significant nuclear industries. However, since such support was not forthcoming in the IGC on the EU Constitution and in a time of uncertainty, Brazel suspects there will be little appetite for a divisive nuclear debate, which might only contribute further to the issues and challenges, which have arisen from the EU Constitution issue.

In spite if this, Brazel believed that all was far from lost, but that it will require a far more subtle approach to the issue than has heretofore been the case.

With respect to the issue of renegotiation, Member States would have at least two powerful range of arguments lined up against each other together with many shades in between. These arguments will be shaped not by ideology but by an assessment of where each of the Member States interests lie. This is the case for non-nuclear States and equally will also be the case for nuclear States. In considering where the balance of interests may fall for each of the 25 countries, one must also have regard to the relatively recent tortuous path of the Nuclear Package proposals.

Brazel´s estimate was that it is not a situation of Euratom or nothing and the polarisation of the debate will serve no one well.

He then continued to elaborate on, what could justifiably be endorsed as achievement under Euratom and conceded that "notwithstanding the problems Ireland has with the Euratom Treaty and these are considerable, it is important to remember that the founding fathers of the EU who agreed the Treaty, did put in place far sighted provisions which have served Europe well".

Firstly, this pertains to the Safety Standards dealt with under the provisions of Title II, Chapter 3 in Euratom. Together with the secondary legislation derived from it, this Chapter has significantly contributed to securing a high level of protection of the population and workers. The adoption and implementation of the latest BSS Directive, as supplemented by the MED Directive, and the adoption of the HASS Directive has continued the progress in terms of reinforced protection.

Secondly, this also pertains to the Safeguards. Chapter 7 of the Treaty constitutes the legal basis of Euratom Safeguards. The obligation to implement the provisions of this Chapter lies with the Commission, which has wide powers under the Treaty to fulfil its task. Since 2004, the Commission has been developing a "New Safeguards Approach". Strong criticisms from Member States against this New Approach have resulted in its implementation being postponed for the time being and an intensive exchange of views between the Commission and the authorities of the Member States is currently taking place.

Brazel pointed to the vehemence of the opposition by almost all member states to the introduction by the Commission of the proposed new safeguards approach as indicative of the real value derived by the Member States from these provisions of Euratom.

Finally, Brazel referred to another important example: The terms of the negotiations with the accession countries on nuclear issues, although there regrettably was as yet no Euratom Directive establishing the basic safety standards for the design, construction and operation of nuclear reactors in the EU. However, in the framework of the enlargement negotiations, Euratom did exercise its competences on nuclear safety. A system of peer review of nuclear safety in the installations in the candidate countries was established, which led to negotiating a number of measures as a condition for accession.

In Brazel's view, hard, difficult and economically painful decisions were taken in imposing conditions on the accession countries, which included shut down requirements. These conditions were based on safety considerations, which from Ireland's perspective must be considered paramount. The EU can justifiably point to the fact that these decisions were taken under the terms of Euratom.

However, there were some problems as Ireland, according to Brazel, saw it:

The Euratom Treaty was designed to promote and encourage an industry that was embryonic. It was intended to share the burden and benefits of what was seen then, as providing "electricity too cheap to meter" - but we know different now.

And he drew the following conclusion:

"It is not unreasonable to expect an industry almost 50 years old to be mature enough to take its place within the EU Common Market. The EU has decided that the market place should dictate the allocation of resources and that state aids and subsidies should not be employed to distort competition. The EU has developed and evolved to meet the profound changes that have occurred in the last 50 years while Euratom continues to promote nuclear and shelter it from competition oblivious to the wider developments within Europe. It is certainly an anachronism but this is probably consistent for the nuclear industry itself. The more it seeks to persuade the public that it should be considered on an equal basis with other industries, the more it seeks to preserve or foster its special position in terms of promotion, investment, competition, research, waste generation and environmental contamination. The Euratom Treaty provides a special position for the industry in Europe, Ireland believes that this is no longer tenable".

Euratom reform could happen by evolution as opposed to revolution. An avenue contributing to the necessary evolution of the Treaty to meet current conditions and demands in the EU could be evolution through case law.

However, although EU Treaties generally have benefited by being driven by considerable case law, which has undoubtedly contributed to the ongoing development and amendment of the Treaties, case law under Euratom has not attracted a similar level of development and evolution. While there have been significant decisions such as the Cattenom Case (C-187/87), the development and evolution of Euratom through case law has not been dramatic. However, the possibilities afforded by evolution through the legal process are best indicated by the decision regarding the competences of the Commission on nuclear safety under the Euratom Treaty (C29/99). This particular case provided the legal basis for the Commission to introduce the nuclear package. While progress on the nuclear package as proposed by the Commission has been disappointing, it does at least indicate that the Euratom Treaty can benefit from legal elaboration through the European Court of Justice. Perhaps with a more proactive approach from the Commission, as ultimate guardians of the Treaties, the potential of the current Treaty can be developed particularly in terms of safety.

Finally, in his summary and conclusions, Peter Brazel stated that he *"believe(d) that any re-negotiation of Euratom will be a two way process, the debate in relation to Euratom review should reflect this reality. For those from the non-nuclear side of the debate, a more focused view of the real possibilities which can be achieved against such a background will need to be developed while recognising the gap between what is ultimately desirable to what is realistically achievable".*

Pending renegotiation, Peter Brazel stated that *"there is a more proactive role for the Commission in maximising the potential of the existing Treaty through development of case law through the European Court of Justice".*

Andreas Molin; Federal Ministry for Agriculture, Forestry, Environment and Water Management of Austria

5. The realisation that there is a vital need for Euratom reform, but that this might be difficult to achieve at least in the short term was shared by **Andreas Molin**, Director of the Nuclear Co-ordination Division in Austria's Federal Ministry for Agriculture, Forestry, Environment and Water Management, in his lecture on **"Prospects for Cooperation on Euratom Reform between Non-nuclear and Nuclear Phase-out Countries in the EU"**.

Although Molin recognised the urgency of moving forward towards the abolishment of the Euratom-Treaty or at least Euratom reform, there was in reality no "fast track" towards a breakthrough. The mere idea of an "anti-nuclear coalition" is counterproductive in itself, because it would almost immediately force the forging of a "pro-nuclear coalition" leading to an even prolonged stalemate.

A successful initiative would imply "contacts first to those who are presumably your opponents, looking for common ground and then talking to your friends. This is what Community Law invites us to do, at least in the nuclear field. This concept has successfully been used by the Austrian government with respect to the issue of nuclear safety in the context of enlargement before during the accession negotiations".

Trying to answer the question: "Where are we now with respect to the issue of Euratom reform?", Andres Molin concluded with regret that not much had happened in the last three years.

Despite endeavours by some Members of the Convention and interesting contributions to the debate - in this context he particularly referred to contribution by Austrian Members of the Convention but also to the so-called "Penelope" paper elaborated under the auspices of the Commission - the Convention failed to properly address the nuclear issue. In the final draft Treaty establishing a Constitution for Europe, the Protocol amending the Euratom Treaty merely provides for unified institutional and financial provisions of the Euratom Treaty but leaves it with a separate legal personality. The Intergovernmental Conference (IGC) following the Convention basically had left things unchanged. In the Protocol, decision-making procedures were in principle harmonised with those foreseen in the Constitution. But according to Molin, a more in-depth analysis shows that it is almost impossible to apply these new procedures, as for most cases the procedures are firmly set in the Euratom-Treaty.

When analysing the current situation, it has to be taken note of the fact that the European Court in a rather revolutionary decision ruled that Art. 30 to 39 of the Euratom-Treaty cover not only radiation protection but also nuclear safety as - in the view of the Court - "it is not appropriate, in order to define the Community's competences, to draw an artificial distinction between the protection of the health of the general public and the safety of sources of ionising radiation". The Commission based her proposal for a nuclear safety directive on this ruling but for the time being there is no sufficient majority in the Council to adopt the proposal.

Nevertheless, the arguments in favour of a substantial reform of the Euratom-Treaty are still valid.

In Molin's view, the European Union is currently faced with a rather unsatisfactory situation: The European Council of Laeken states in its Declaration on the Future of the European Union the case for making the Union more democratic, more transparent and more efficient. Nevertheless the Draft Constitutional Treaty perpetuates two separate legal entities. Although the Convention's work was guided by a strong commitment to more democratic structures and procedures, it set aside the reform of the Euratom Treaty – thus excluding co-decision by the European Parliament in an entire sector of policy making.

Another vital conclusion of Molin was this: *"Although the European Union is heading for an open and transparent common electricity market, the nuclear industry, an essential sector of this market continues to be governed by a specific set of rules, thus distorting competition between the different energy resources".*

This is the reason, that the Austrian Government has joined in a declaration to the Constitution supporting the idea of a Conference of the Representatives of the Governments of the Member States, which should be convened as soon as possible to reform the Euratom-Treaty. On the one hand, from an Austrian point of view, it is a success that altogether five governments supported this declaration; on the other hand this is far off the support needed to even start a new intergovernmental conference. Unanimity is needed to change the Euratom-Treaty or to integrate those elements, which are still needed into a future Constitution.

Trying to answer the question: "Is there a way forward?", Andreas Molin said the following:

"Yes, there are some approaches to keep things moving. Firstly, it is very important, that the citizens of Europe make their voice heard. The larger the support and the more countries involved the bigger the possible political impact will be. Secondly, the European Parliament should be involved even more than it is today, thus adding to the political momentum. It should be noted, that the European Parliament has repeatedly asked for fundamental reform. Thirdly, it will be of the utmost importance to engage in an intense dialogue with those currently opposing Euratom reform, be it governments or other stakeholders. This dialogue must be honest; it will be difficult and most probably take years".

And he concluded: *"A major prerequisite for those engaging in this dialogue will be to accept that some Member States will not phase-out nuclear power in the foreseeable future and might even re-establish nuclear power programmes".*

Debate: "What Future for the Euratom Treaty?"

6. The participants of the debate **"What Future for the Euratom Treaty?"** were **Andreas Molin**, the Austrian Environment Ministry, and **Nina Commeau-Yannoussis**, Head of Unit of Energy Policy and Security of Supply, European Commission Directorate-General for Energy and Transport. The debate chair was **Dominique Voynet**, French Senate member and former Minister of the Environment.

Dominique Voynet started by mentioning her friendship with the former Danish Environmental Minister, Svend Auken, and commented on her long experience as Minister of Environment in France, working in a large coalition of leftist parties, all in favour of nuclear power, except for her own party, the French Greens. In spite of this, the French government decided not to build any new nuclear power plants and stopped the European Pressurized Reactor project and the Super Phoenix breeder reactor. Dominique Voynet was particularly proud of two other decisions from her time as Minister of the Environment: Gaining the support of the Prime Minister to take position in the European debate against any nuclear in the Clean Development Mechanisms of Kyoto and a government decision on an important protocol concerning radioactivity in the OSPAR Treaty[10], banning liquid radioactive emissions in the sea by the year 2020.

She then proceeded with a brief historical outline of the early historical developments of European nuclear power and the emergence of the Euratom Treaty, especially emphasising its promotional nature by extensively quoting the Preamble and Article 1 of the Treaty. Presently, the European Union has nothing in common with the European Community of the fifties. While the European Union has radically changed, the nuclear industry has been in constant decline for over fifteen years. However, the Euratom Treaty remains intact, separated from other EU legislation: Euratom decisions are not subject to co-decision with the European Parliament and Euratom has its own research and development program. At the same time, other energy sources have reached maturity under very difficult conditions.

According to Dominique Voynet, it was time to face new questions. The reluctance towards nuclear power is very high, even in France. According to a new opinion poll concerning the sensibility of the citizens regarding nuclear waste, 89% of the people in France would not accept a nuclear waste underground storage facility in their neighbourhood and 53% want France to phase out nuclear power entirely.

She then asked Nina Commeau-Yannoussis and Andreas Molin the following questions:

"Isn't it high time to review the Euratom Treaty, abolish the different standards, the particular conditions, and finally create a level playing field for all energy sources and in particular for energy efficiency and renewable energies? Isn't it urgent to get legally binding decisions on nuclear security, safety control, waste management, decommissioning, effectively under co-decision procedures with the European Parliament? Isn't it indispensable to finally adopt transparency and

[10] OSPAR Treaty = *The Convention for the Protection of the Marine Environment of the North-East Atlantic*.

democracy in a sector that has too often escaped public scrutiny and control? These are questions for both of you".

Furthermore, she directed the following question to Nina Commeau-Yannoussis:

"In 2002 in Brussels, you said and these are your words: The first article of the Euratom Treaty might be somewhat obsolete, being so proactive in promoting such an energy source. The Commission has acted in the past as an executor of the provisions of the Euratom Treaty. Is the Commission now ready to start a review process of the provisions of the Treaty that are obviously in conflict with its own policy objectives? Doesn't the Euratom Treaty hinder the realisation of Commissioner Piebalg's six priorities as presented in April 2005: Energy efficiency a top priority, internal market of gas and electricity, renewable energy, nuclear safety and security, European Union external policy relations and better linkage of energy and environment research policy?"

Finally, she commented on Andreas Molin´s speech on "Prospects for Cooperation on Euratom Reform between Non-nuclear and Nuclear Phase-out Countries in the EU":

"You explained that you are not convinced that the Austrian Presidency was the best moment to push for your own priorities. I hope you won't be angry if I say that I don't agree at all with you. Of course you have to pay the price of a decision and you won't get everything you want. It is not always the best place to push for your priorities, but it is sometimes possible with or without the Commission. I give you only one example: During the French Presidency in the second semester of the year 2000, we decided - because we had a sufficient minority of a vote – the European moratorium on GMOs and it has lasted four long years. Yes, we depended on the Commission partly, but not totally, and I think that we should use the possibilities to have a dialogue with the Member States that won't phase out or worse: Who decide to go on, Finland or France for example. We should also use all the occasions to discuss with the Commission its role and the evolution of its role concerning the new international context of the price of gas, the greenhouse effect and the main priorities of the European citizens".

She then suggested two ideas for the Austrian Presidency: To commemorate the twentieth anniversary of Chernobyl – especially by focusing on the question of tourism of nuclear waste between the European Union and Russia – and dealing with the big radioactive pollution of the sea originating from Sellafield and La Hague.

Before answering the questions, **Nina Commeau-Yannoussis** made a comment, opposing the idea of putting the European Commission on one side and the Member States and the Council on the other side, stressing that the Commission is working for the interest of the European Union and its citizens. Otherwise, the work would not have sense. So, if the future Presidency thought that the Commission was working against the Presidency, it would be a misunderstanding.

She then confirmed that she had said that the Preamble of the Euratom Treaty is obsolete and would continue to say so. The most active policy the Commission has is on sustaining renewable energy. The Preamble was reflecting the thought of the Member States in the 50ies. At the same time, she did not believe that the Preamble was the most important part of the Treaty. If one looks at all the chapters of the Treaty, during these fifty years some chapters are not being used at all. For instance,

the internal market for uranium is a completely dead chapter and some of the other chapters have more importance today than they had in the beginning.

In her own opinion – and this view was not on behalf of the Commission – the Euratom Treaty has some very good aspects. Some of the legislation has been translated in the Member States and all the Member States have agreed with that. The opinion of the Member States on the nuclear package, which concerns nuclear safety, decommissioning and waste management, is that some anti-nuclear countries were in favour of this package and were happy that the Euratom Treaty allows these kinds of proposals as was the case with Austria and Luxembourg, but not Denmark.

She then said the following:

"So I don't think it is easy to say that "because we are against nuclear, we don't want the Euratom Treaty". I believe that you can be against nuclear and love the existence of Euratom. Of course, I know that some people are saying that because Euratom stays and because it is controlling the activities of the nuclear industry, it allows the development of nuclear. OK, I can understand this kind of position. But I don't think that it is so simple. It is not a question of black and white. You can find some good aspects of having this Treaty and some less good aspects. In my opinion it is difficult to say that because some aspects are obsolete, we have to forget the Treaty. In our DG[11] *we made the exercise of thinking about a completely new structure for a new Constitution. I am sure that you know this project, which is the Penelope project. When we had done this exercise, the idea was to answer the question: Do we really need the Euratom Treaty? If some of you have seen this project, you will see that there is no Euratom Treaty in the Penelope, but we take some parts, because we consider that even if you have to forget the Atomic Energy Community, you should have some legislation on nuclear activities, because they exist".*

With respect to the subject of policy objectives, Nina Commeau-Yannoussis stated - and this was on behalf of the Commission – that the most important concept for her is diversification of energy supplies all over the world and diversification of energy in the European Union, so that energy should be an open option to the Member States.

With respect to the question of a better link between energy and the environment, she stressed that she as a policy maker would say that environment is a part of the European energy policy, but with regard to nuclear, environmental opinion could change. For some the most important issue is radioactivity and waste, for others it is CO_2 emissions. Member States can choose what they want themselves.

Andreas Molin began his answer by stressing that he as a good civil servant had to say that everything he said would be his own personal opinion, not that of his government. He thought that it would be important to clearly distinguish between the position on nuclear power as such and the position on the Euratom Treaty. If that was intertwined we would end up nowhere. From his and the the Austrian perspective, it was clear that they were anti-nuclear. They did not like nuclear power and thought that they had very good arguments against it, but that has nothing to do with questioning the Treaty in the form as it stands now almost unchanged for some fifty years. In Andreas Molin's opinion, there was no confrontation between the Presidency or the incoming

[11] DG TREN = The European Commission Directorate-General for Energy and Transport.

Presidency and the Commission. There was a very delicate balance of power between the Parliament, the Commission and the Council and each of these institutions had their own agenda in institutional terms. The Austrian Presidency had areas where it had similar interest or joined interest with the Commission, seemingly with respect to the nuclear package, and areas where it did not agree, particularly on the research program. But there is no natural antagonism or fundamental dispute. A Presidency is not only bound to what the Commission offers, there is room of manoeuvre in terms of political initiatives.

Andreas Molin then stated the following:

"Maybe I have been too defensive in my first intervention. If we see an opportunity to do something, we will use it. Lately we have been sitting together several times, my team and others, trying to consider options, if there is anything reasonable we can do to move things forward. That has not come to a final result, so I cannot announce now, what we are going to do. But we try to consider also the changes on the European scene to see if we can do something".

With respect to the 20th anniversary of Chernobyl and the question of transport of waste from Europe to Russia, the issue of the rules under which nuclear waste can be shipped out of the European Union is in the heart of the discussions on the Directive which is currently still on the table of the Council. It might be that the UK Presidency will finish the dossier. It might also end up with the Austrian Presidency. With regard to the commemoration of Chernobyl itself, Andreas Molin found it difficult to do anything reasonable, because there already are so many conferences and symposiums of all kinds of orientation that it does not really make sense for the Presidency to add just another one.

Andreas Molin was willing to pick up the idea regarding the discharge of radioactivity to the seas: On the one hand Austria lacks experience, because it is not a country having a coast, on the other hand maybe this is an opportunity to act as a middleman, because Austria has no vested interests. He then said the following:

"As I said, we have no direct confrontation or dispute with the Commission, but sometimes it is a little bit difficult to work with the Commission (...) Yes, we were surprisingly enough in favour of the nuclear package, but to put things right: We were in favour of the Commission taking the initiative and raising the issue and starting a discussion. We were not so much pleased by the provisions in your proposal. I have to say that clearly. And honestly speaking, at least from our point of view, when we got to the first text we were a bit lost. The subsequent debate on the Council level showed that the proposal was not – I hope I am not too impolite – it was not really well prepared.

To pick two examples: The one is with the money for decommissioning. That is a real urgent issue. And from the Austrian point of view, it is absolutely clear that we are convinced that the money for the decommissioning should come from the power generation, not from tax-payers money, which in the end will increase the price of nuclear electricity, but that is market. It has to be insured that the money is there when it is needed, because it will be needed in a few decades. And nobody knows if any of the power companies that are operating today, owning nuclear power plants, will still be there. So you need something that is to a certain extent outside the grip of the power companies, to save the money for the future. And this is also important: It must not be misused to distort the

electricity market right now, because that is exactly what has happened in recent years. Those power companies, having already assets for decommissioning, used the money to buy anything they could get on the market in terms of smaller companies. This is not exactly what we like very much. But to a certain extent that was part of the Commission's proposal and we welcome that. But it was immediately turned down by the legal experts who said that you cannot base this on the Euratom Treaty, because the Euratom Treaty has no provisions on competition and that is correct. So it was kicked out within a few hours of discussion. That is what I mean when I say that it seems to be not well prepared. I mean, the Commission's legal experts are really good and the people in its legal service know their job and they could have said in a minute that this is a shaky thing and that there might be opposition to it".

The other issue that according to Andreas Molin was not well prepared in the nuclear package was the issue of the Commission acting as a super-regulator, which none of the Member States would have accepted. To say to a chief regulator, now you have a super-regulator above you was unacceptable to any government. Stressing that this was his own personal opinion, he called for more democracy in Euratom and not least the participation of the European Parliament in the decision-making process. Finally, he mentioned one element in the Treaty which in his opinion was outdated, namely the Euratom Supply Agency, which regulates the uranium market. The Agency was described as a dinosaur with a lot of civil servants, costing a lot of money, in his view for nothing.

Nina Commeau-Yannoussis responded by denying that the Euratom Supply Agency, which only had ten employees, was a dinosaur. According to her, the Agency in the present configuration of the system was a useful institution because it has a useful insight into the uranium market. The European Union is importing 80% - 90% of its uranium needs, so the Agency is here to control and to say if something is wrong or not.

With respect to the subject or the nuclear package, she said the following:

"The idea of the nuclear package was of course to have more community legislation on safety. It was not only the opinion of the Commission, it was an opinion prepared also with other actors, that we have to act on two aspects, which are decommissioning and the control of nuclear safety. I don't believe that in the proposal Directive it was not clear what we wanted with respect to nuclear safety. It was very clear, but of course the opinions were different. Yes, I agree with you it was not possible, it is not possible even today after a long debate and perhaps it is not useful to have a super-regulatory nuclear authority. But a group of controlling teams of old European authorities, it would be a good thing. And in fact, it was a transposition of what has been made for the new candidate countries during the negotiations. A team of regulators made their opinion on the new Member States' nuclear power plants. We thought that it is a good thing to transpose if the 15 Member States could make this control of nuclear safety in the candidate countries. Why can we not transpose this method for all 25 Member States? In one sense, it is even fair to do that.

OK, in decommissioning funds there is of course an aspect of internal market and I agree with that, but we believe that the most important thing, even if I know that the European Parliament was arguing that it should be a proposal on the EC Treaty, but we consider what is more important, the fusion of the market or nuclear safety? We consider that it is nuclear safety. That is why we proposed the decommissioning funds under the Euratom Treaty".

Summaries of the afternoon programme's speeches, presentations and debate

Mycle Schneider; International Consultant on Energy and Nuclear Policy

7. Mycle Schneider, International Consultant on Energy and Nuclear Policy from Paris, gave a presentation on "**Status and Trends of the World Nuclear Industry"**.

Mycle Schneider started his presentation by emphasising that rather than participate in the speculation on the revival of the nuclear industry, which is currently going on, it is significantly more helpful to look at where the nuclear industry actually comes from, how many nuclear reactors have been built and what the tendencies are. In order to understand things it is helpful not only to look at just one particular picture, but rather to see what the developments are, to watch the movie.

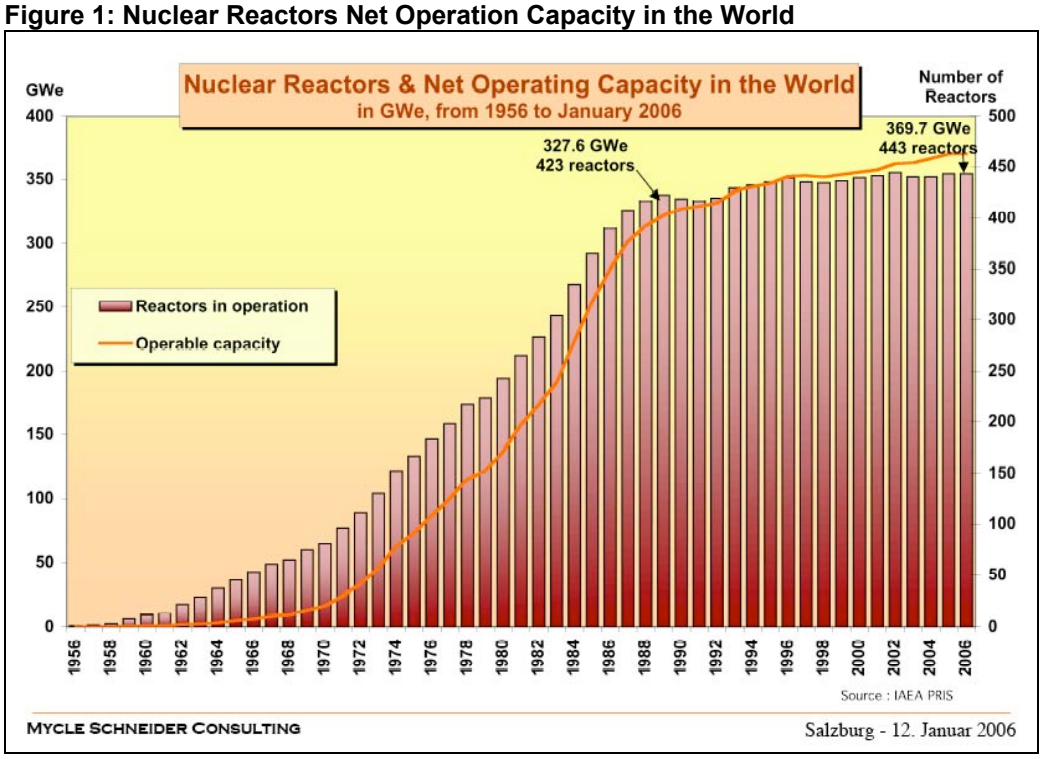
Looking at the reactors, which have been in operation since 1956, there has been an uninterrupted increase of operating reactors until 1989. The following year, for the first time, there was a break in this tendency.

Since that time developments have been oscillating on the same level. The figure has increased inside a number of 20 units over the 15 year period between 1989 and January 2006, so it is very much a stabilisation of the number of reactors in operation in the world.

At the same time the installed capacity of the reactors has continued to increase. The reason for this is very simple: New reactors are larger than old reactors, so the replacement capacity is higher. Also through so-called uprating, the capacity of existing nuclear power plants has been increased.

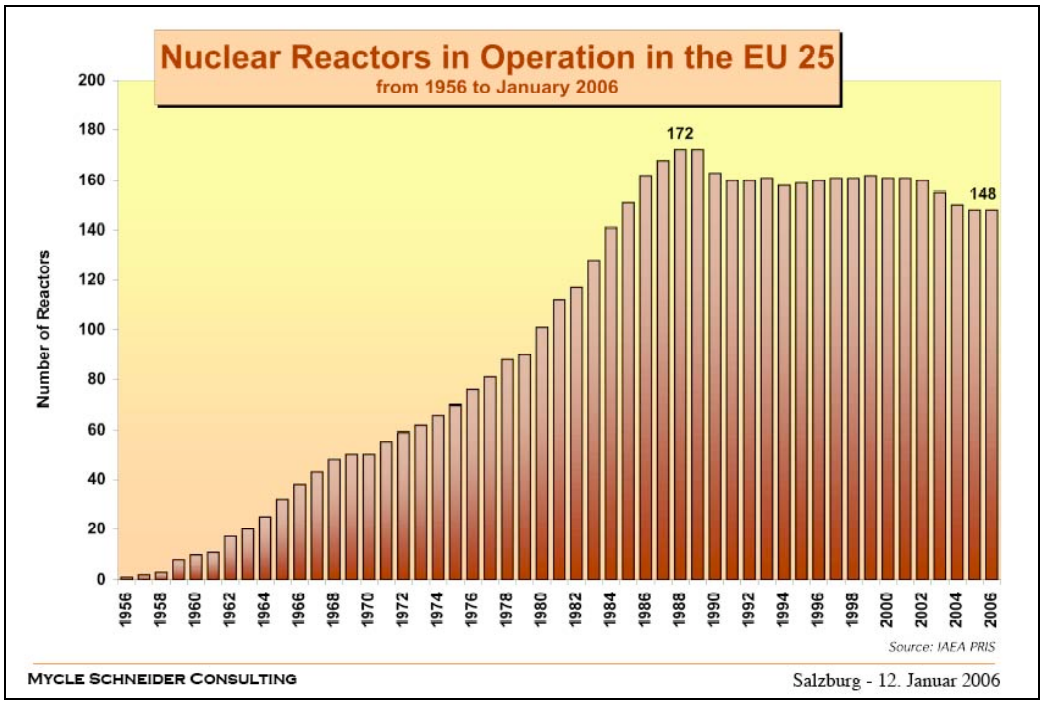
There are several technical means to do this. In most cases steam generators, which have not had the expected lifetime have been replaced by steam generators with higher capacity. For some countries the increase has been significant, e.g. Switzerland where the increase through uprating has been more than 20% per reactor. With 5 units in operation, that means that actually the equivalent of one full unit has been gained exclusively by uprating.

Figure 1: Nuclear Reactors Net Operation Capacity in the World



With respect to the European Union the development in the number of nuclear reactors is similar to the global trend. But since 1989 there has been a quite significant decrease: In early 2006, there were 24 units less in operation than in 1989. Presently there is only one reactor under construction (in Finland).

Figure 2: Nuclear Reactors in Operation in the EU 25



Concerning the electricity generation, Mycle Schneider stated the following*:* In 2003 only 31 countries – approximately 15% of the U.N. membership - produced nuclear electricity. Furthermore, a few countries produced the vast majority of the electricity generated worldwide. Six countries – The United States, France, Japan, Germany, Russia and South Korea – produced roughly three quarters of the world nuclear electricity. Three of those countries – United States, France and Russia – are nuclear weapon states. That is important for the development of the whole nuclear power generation. When it comes to the EU, nuclear power provides roughly one third of the electricity, but one should bear in mind that 45% of the nuclear electricity is actually produced in one country, namely France.

In order to get a perspective view of the global nuclear power industry, it is interesting to look at the age structure: *How many units have what age?* The majority of reactors in operation is 20-25 years of age with a mean age of close to 22 years. That is the age structure of the currently operating nuclear power park worldwide. One should also stress that, because of the small numbers of reactors that is coming online, the average age is increasing significantly.

In the EU the average age has increased about 7 years within a decade. So without new plants coming online, the reactors are aging rapidly. In all considerations about age one also has to think about industrial experience as it stands. As of early 2006, 109 reactors in the world have been shut down permanently and one can take a look and see for how long they actually operated. Perhaps a bit surprising is the fact that a large number of units has been shut down the first 15 years of operation.

There is a large number that has been shut down before the age of 30 years. 17 units have reached an operating lifetime of 30 years ore more. Half of these are small military reactors that have also produced electricity, which are not really comparable to the current generation of nuclear power plants. So in other words: The industrial experience of long operating lifetimes is very small. This one has to bear in mind when lifetime extensions are discussed.

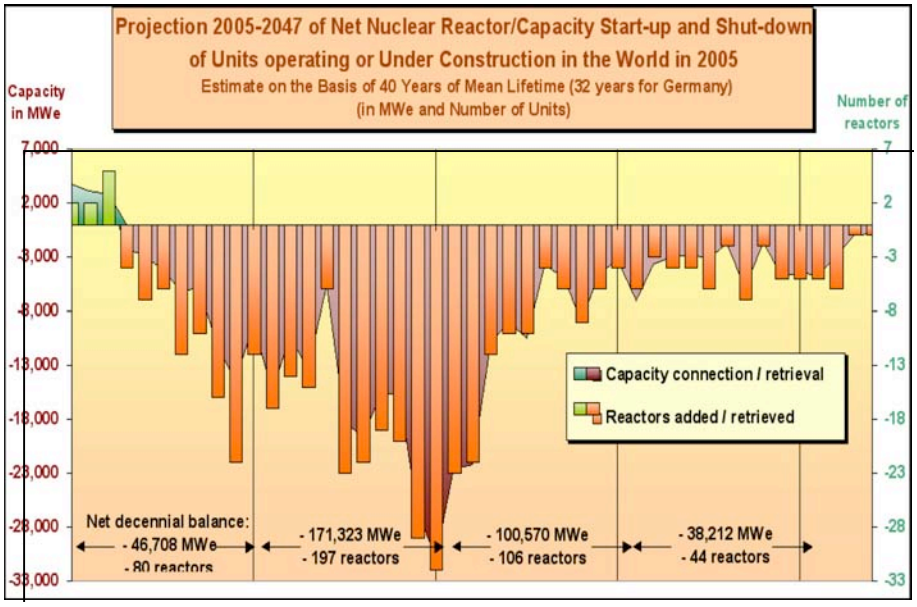
According to Mycle Schneider, there are all kinds of figures floating around in the international discussions on the expectance of lifetime. However, it seems that most of the utilities that operate the reactors expect lifetimes of about 40 years.

So the question here is: *How many reactors turn age 40 when?* We do not know how long they will actually go on and whether they will reach 40 years of operation or whether they will be shut down before. But if they do reach age 40 – and again this is almost twice as much as the industrial experience so far, so it is quite an optimistic view on things – you can see (in the figure below) which kind of pyramid we would get when they have to be stopped.

The only exception is Germany, which has a nuclear phase-out law, which calls for the shut down of units at the equivalence age of about 32 years of production. The other country, which has a phase-out legislation in place is Belgium, but there the limit is 40 years, so that does not change the statistics by any means. The result is that within the timeframe 2005-2015, about 80 reactors turn age forty. In the following decade there are roughly another 200 units that will turn age 40.

Also of interest are the long lead-times (the time necessary from the original decision to build the nuclear power plant to the delivering of electricity to the grid), which are in the order of ten years at least in Western Europe – in Eastern Europe they are mostly over 15 years. During the phase of reactor construction more orders have been cancelled – at least 138 – than carried through. Also: The last unit to be ordered in the U.S., which was not cancelled, had a construction time of 23 years. It was ordered in October 1973 and completed in 1996. It would be a subject for a doctoral thesis to try to calculate what the financial costs are in a case like this. Considering that the term "under construction" is relative, the long lead-times are important for the perception of the actual health of the nuclear industry.

Figure 3: Projection 2005-2047 of Net Nuclear Reactor/Capacity Start-up and Shut-down of Units operating Under Construction in the World in 2005.



Mycle Schneider ended his presentation with the following statement:

"The basic conclusion is that although there today is a lot of talk of a renaissance or revival of the nuclear industry, the facts are not there. The only thing that one can see is an aging industry and that the industry right now is very far from showing any indication to be able to get the orders needed to replace the units that are being shut down. I think it is perfectly clear – especially over the next decade, when 80 units turn age forty – that these units will not all be replaced. That would be industrially impossible. It is very strange to talk about a revival of an industry when actually the only way to maintain current operating numbers is to enlarge lifetime. That would be the only way to have even the slightest chance of maintaining the current number of reactors. In my view there is no sign whatsoever of a revival of the nuclear industry worldwide. And as you can see it would not change the outcome, even if China built 30 units as has been claimed. And by the way, China has also made all kinds of announcements in the 1980ies which never came true".

Yves Marignac; WISE-Paris

8. Yves Marignac, Director of WISE-Paris, gave a presentation on **"Nuclear Power as a Solution to the Climate Problem?"**. Posing the question "is climate change a lifeline for nuclear power?", he started his lecture by establishing that the nuclear industry is on the decline and that the so-called "nuclear renaissance" has so far been a bluff. However, because of the long life cycle of its plants the nuclear industry still have time to organise for survival and for this, the concept of climate change comes as the obvious lifeline. Thus, the nuclear industry depicts itself as "the alternative" with some success towards policy makers and even some ecologists. Against this, opponents mostly point to the lack of legitimacy of the proposal given the well-known specific risks of the nuclear industry

He then made a broader analysis of the effectiveness and relevance of nuclear power in tackling the climate issues. Commenting on the thesis that "a nuclear power plant does not emit CO_2" because its fuel is fossil but not carbon, Yves Marignac pointed out that this argument was arguable. Basically, it depends on hypotheses for life cycle calculations as nuclear power consumes a lot of energy before and after it is used. Nevertheless, nuclear power emits much less CO_2 than fossil fuels and even less than most renewables in some calculations.

On the subject of emissions "avoided" by nuclear power, he stated that fundamentally it is impossible to compare the same system with or without the use of nuclear power. Nonetheless, this has been done on several occasions. For those who want to demonstrate the effectiveness of nuclear option the worst-case hypothesis is 300 geC/kWh (substitution to coal, etc.). More realistic views take the existing mix into account. E.g. a realistic calculation would be 100-150 geC/kWh (average substitution). There is also a hypothesis that the same substitution could be obtained with wind power. An optimistic view of this: At most a few tens geC/kWh could be obtained by the nuclear option. There is also the assumption that the equivalent energy could be saved, which would make the nuclear option obsolete. All in all there is no meaning in looking at the subject of emissions "avoided" in the perspective of one or more reactors.

As a minimum you have to ask the question: "What impact does nuclear power have in the energy system of a country?" The answer is that the examples provide with results, rather than calculations. E.g. The United States is both "champion" of nuclear power (30% of world share) and GHG emissions (about 25%). There is no sign of a "nuclear alternative" there. The same pertains to The European Union: 30% of its electricity originates from nuclear power but the EU is not on track to meet its objective under the Kyoto Protocol. There is no correlation between trend in Member States and their share of nuclear power. France is the premier example of this: The country has 78% of its electricity from nuclear power but will not meet its objective of stabilizing emissions. France is not matching its long-term objective of 4-fold reduction by 2050.

Regarding nuclear power's impact in the energy system at world level: Nuclear power which generates 17% of world electricity today represents the range of 300 MteC avoided, which is equivalent to the results expected from Kyoto. However, it took it 50 years for the nuclear industry to reach that point (although of course not with the aim to contribute to climate change). Meanwhile, CO_2 emissions from fossil fuel consumption have risen about 15 times more (+ 4.700 MteC). Carbon emissions from this sector account for 15-20% of all anthropogenic GHG emissions.

This sets the level "needed" for nuclear power to solve climate change alone to a rough 10-fold increase.

Yves Marignac then tried to answer the question: "Is the nuclear option a practical solution to global warming?". His answer: It is not consistent with the gap between actual development of nuclear and levels of reduction that must be addressed. Other advocated tools are energy efficiency and renewables, which clearly have as much potential as nuclear today (3% of final energy consumption worldwide). The issue in this respect is to choose between these options in a policy that is a breaking policy in any case.

Lessons to be learned from prospective scenarios: World IIASA[12] scenarios cross hypotheses on renewables and nuclear share with hypothesis on energy demand. Moderate consumptions scenarios generally show emissions levels in 2050 two to three times lower than high consumption scenarios.

Scenario with 6-fold increase of nuclear power and renewables and high demand (A3): 15.1 GteC in 2050 (compared to 6.0 in 1990). Scenario with nuclear stable, development of renewables and low demand (C1): 5.4 GteC in 2050. Demand side is the key, not nuclear supply. Scenario with 3.5 nuclear increase, same renewables and low demand (C2): Only 2% savings more in cumulated emissions. Conclusion: Low additional value of nuclear power.

Trying to answer the question "is the nuclear option legitimate?", he stated that it would have to be evaluated in the perspective of the problems facing nuclear power today (accident, proliferation, waste, terrorism, etc.), the "need" for a steadily and massive development, promises of "sustainable nuclear energy" with Generation IV and the implicit acknowledgment that current technology is not sustainable, in spite of the fact that it is current technology that would be used. In this respect, it should be remembered that there are strong doubts on the capacity to meet Generation IV objectives after 50 years of efforts already. His conclusion: More precise and sound answers are needed.

Another question is, how effective the nuclear option really is. Based on a logic of substitution that is intrinsically limited in scope and pace, it is evident that it is not suitable everywhere (and for that reason excluded of flexibility mechanisms), not for all energy uses (and not at any level) and also subject to geophysical limitations and eventual scarcity of resources. How effective is it with respect to effect? Clearly, it cuts some emissions down but it does not reverse an overall rising trend. In principle? It is self-evident that as the potential of alternatives increases (technical progress, etc.), the effectiveness of nuclear substitution decreases.

Answering the question "is the nuclear option (still) relevant?", Yves Marignac stated that the nuclear option is not the alternative but it could still represent a contribution limited in time (transition) to some countries.

There is also the question of the systemic impact of nuclear power. Experience tells us that so far it has been an obstacle to the development of ambitious demand side policies and renewable programmes everywhere. So, might it be a part of the problem rather than of the solution? The best way to answer this question is to make a comparison between Germany and France, e.g. the development of wind power or the renovation of households to reach a standard of 50 kWh/m2.

[12] IIASA = The International Institute for Applied Systems Analysis.

Yves Marignac drew the following conclusions from his presentation:

"The nuclear industry's stance as a solution to climate change is driven by an attempt to survive on promises. But the nuclear industry is not in a legitimate position to guarantee its sustainability and it has not demonstrated decisive effectiveness in cutting emissions. On the contrary, it is very likely to maintain or create systemic obstacles to much more legitimate and effective solutions. Hence, it is somehow used as a "conservative illusion" to resist realistic changes for those who don't want them. From that perspective, it is rather the nuclear problem that appears as an obstacle to the solution to climate change".

Bent Soerensen; Roskilde University

9. Bent Soerensen, Professor of Physics from Roskilde University, gave a presentation on **"The Potential of Renewables Worldwide and in Europe"**. Bent Soerensen started his lecture by posing the following questions: What is the potential of renewable energy, how much is there, could we envisage a future, where a 100% of our needs are covered by renewable energy and what is the situation today?

In order to answer these difficult questions he first presented a figure showing a global end-use energy scenario 1994-2050, where energy efficiency is taken into account. The scenario, which assumed global solidarity and no major wars, consisted of 3 columns for each regions of the world.

The first column showed the UN projections for the population development 1994 to 2050, indicating that in Africa, there is a 3 times increase in population, but in most other regions, the UN expects less increase.

The two energy columns reflect the energy increase per capita and the total energy end-use increase excluding food energy 1994-2050. According to Bent Soerensen, small increases are expected in Europe and in the United States. However, the welfare that is the result of this will not decrease, because the scenario takes into account all the energy efficiency measures. The assumption is that by the mid 21st century, the average technology in use will equal the best current technology, with respect to energy efficiency.

This is compounded with increasing population, increasing urbanisation, and increased per capita activity level by an average factor 2.7 for energy use. The GNP activity growth factor will be larger due to the de-coupling of economic and energy growth, and the distribution between regions will not be even, because a larger growth rate is assumed for the presently poor regions. Hence, in large countries like China and India, there will be a growth of about 4 times energy end-use per capita, but if the growth excludes energy used for food there will be almost 8 times more consumption compared with today.

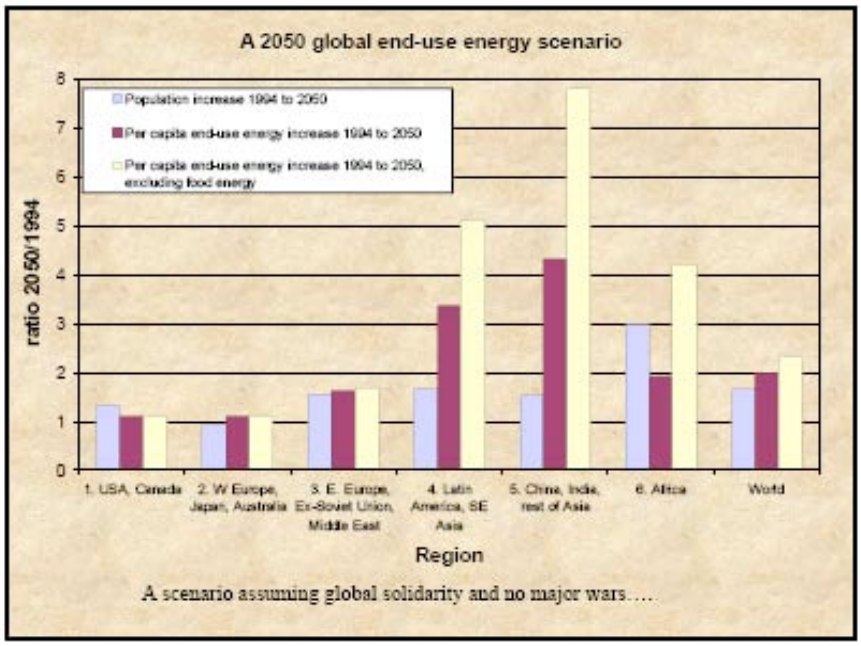


Figure 1: A 2050 global end-use energy scenario

Figure 2 illuminates the same problem complex, but on a geographical scale, where one can see for each m^2, how much energy is needed. This and the following figures are based on monthly calculations for a typical year. Hourly simulations have been performed for Denmark. The Figure shows the total energy delivered to the end-users in the 2050 scenario, including energy for space conditioning, process heat, stationary mechanical energy, electric energy, energy for transportation and energy in food, for all sectors of society. The average energy demand is 0.9 W/cap. or three times the amount made useful at the end-user today. The energy made useful at the end-user at this point in time is only about 12% of the primary energy, and the challenge is to increase this fraction is the future.

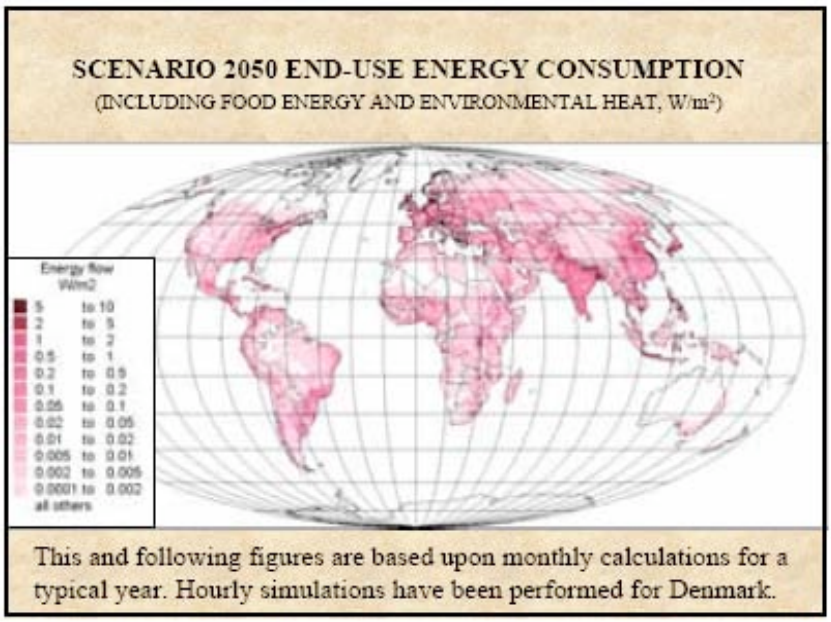


Figure 2: Scenario 2050 end-use energy consumption (including food, energy and environmental heat, W/m2)

If these scenarios represent the challenge for renewable energy, then the question to ask is, whether renewables can meet it. Can renewables provide this required demand in all regions of the world?

Figure 3 shows why alternative energy sources are so urgently needed. Fossil fuels are running out very quickly. Oil is a depletable resource and findings of oil in new fields have declined since about 1965. On the other hand, enhanced recovery techniques using gas injection have been developed, increasing in many cases the extraction of the oil in place from under 40% to about 50%. Further improvement of extraction techniques could in some cases increase recovery to 60% or 70%, albeit at a higher cost. During the last 50 years, oil exploration has taken place in all corners of the world and the chance of large unexpected finds dissenting from the trend depicted in Figure 3 is very small, although the possibility cannot be excluded.

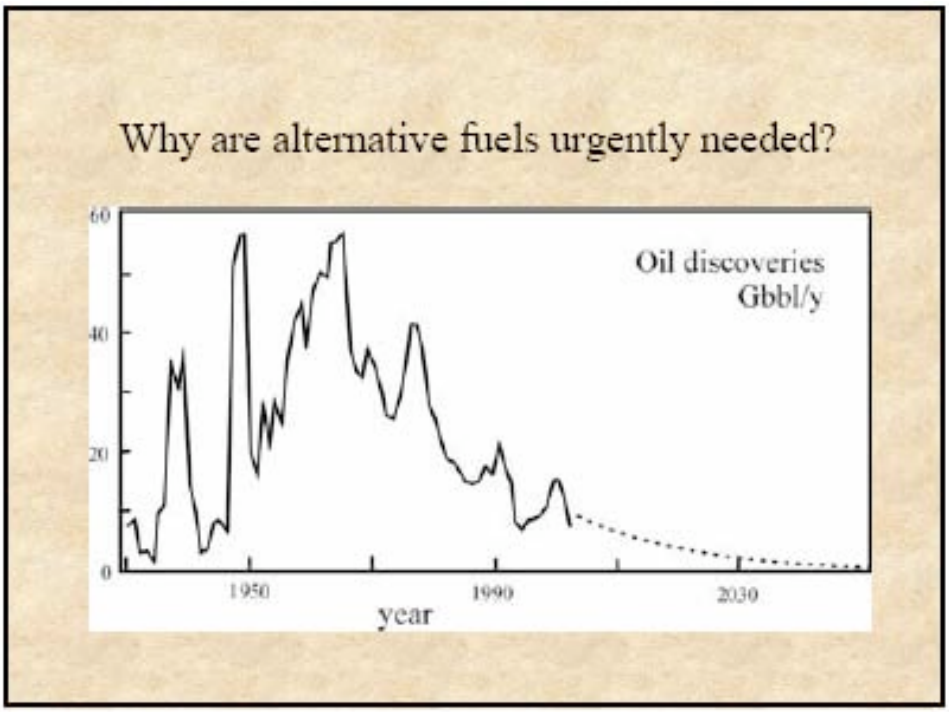


Figure 3: Year-by-year global oil discoveries (solid line) and a model for future finds (dashed line) (1,2)

In the light of these considerations, it is not difficult to formulate models for possible levels of oil production in the near future and compare them to expectations for oil demand. Figure 4 summarises a range of such models for oil production and the associated consumer price, including unpredictable fluctuations. Until the present time, the top part of Figure 4 shows a historic oil production that essentially follows demand. That means that the production of oil, which was rising in the first half of last century, then goes back from 1950 and then reached a plateau under the two oil crises in 1973 and 1979. After that, the associated price increases and demand changed from the exponential growth of the previous period to becoming nearly constant. This was mostly due to more efficient use of oil and to substitution with other fuels, which was possible in industry and for power supply, but not in the transportation sector. We are now on this plateau of oil production.

According to Bent Soerensen, the expectations for the next decades are renewed growth in oil products used for transportation, due to the rapidly growing car ownership and air travel in countries with expanding economies, such as China. The growth in oil makes the expected reserves of Figure 3, exploited with use of enhanced recovering techniques, last to about 2040, and the geographical distribution of oil resources is such that OPEC production will have to rise by at least 60% during the period, while production in Europe and the US declines. The uncertainty in estimating the duration of reserves at different assumptions regarding price and improved extraction does not move the "trouble point" more than a few decades, but even this is quite important for the effort of developing alternatives to oil.

Estimates from e.g. IEA, the Center for Strategic and International Studies in Washington and the oil industry itself recognise that there will be additional costs associated with raising oil production with 60%. The consumer price may continue to fluctuate wildly, the way it has over the past 20 years (*see the lower part of Figure 4*), but ultimately the supply problem can only lead to higher prices, as long as no backstop substitution fuel has been identified. Candidates such as liquefaction of coal or biomass into oil-substituting fuels currently have price tags in the order of 100 US$/bbl of oil equivalent. If substitution prices become lower, a softer transition with partial substitution of oil over a longer period of time may emerge, as indicated in Figure 4. The point is of course, because of this depleting curb, the price must go up. Obviously, it will have all kind of fluctuations, because we know that the oil market is a very nervous market, but it cannot avoid the permanent effect of depletion.

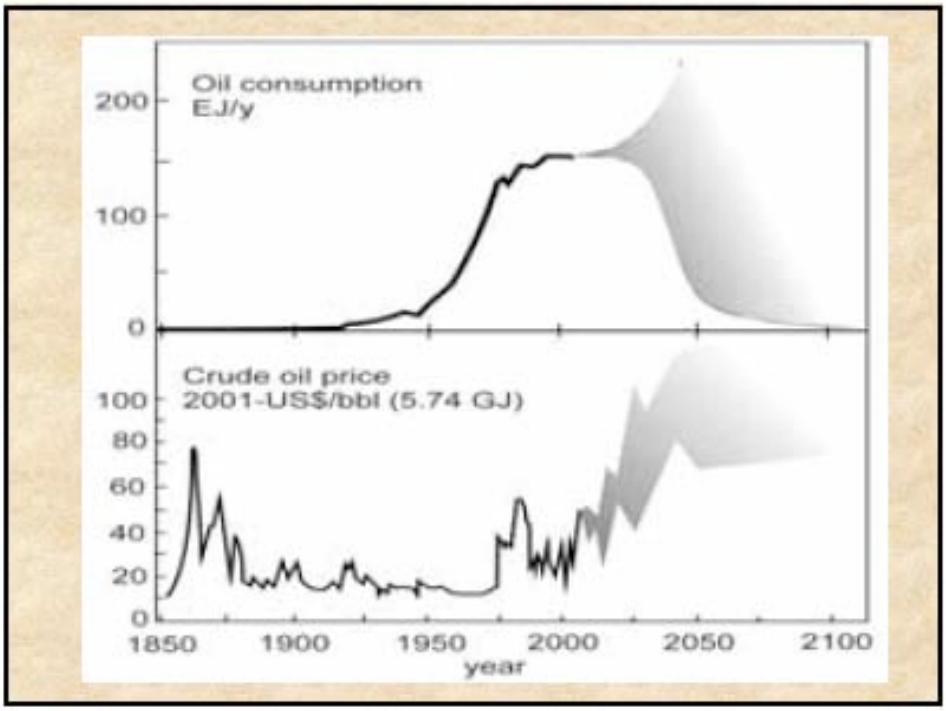


Figure 4: The historical global consumption of oil (top) and the historical price levels of crude oil supplemented with model estimates of possible future behaviour (bottom)

Bent Soerensen then asked the question: "If oil is not the solution to the demand problem, what are we going to do?"

In his opinion, fission was clearly out, because of lack or fuel resources. There is only enough uranium for the 2% nuclear penetration, which exists today. If nuclear generation was to come in and replace the fossil fuel that is disappearing, it would necessitate 80% nuclear penetration and then the resources would not be sufficient, not with light water reactors. In reality, the future of the nuclear option is depending on advanced fast breeder reactors, but they are yet to be developed. The breeder experiments that have taken place have all more or less failed and to do something, which is safe and does not produce proliferation is a major project, which will take at least 25 years or perhaps rather 50 years to complete. Fusion is the same, 40-50 years in the future - it was always that time perspective even when the project started 40 years ago.

Clean coal - taking the carbon dioxide out of the coal e.g. by transforming it into hydrogen – is in Bent Soerensen's opinion an interesting development, but the problem in this context is that the carbon has to be stored. There are various ideas on how to store it, for instance by doing it at the bottom of the ocean, but none of these ideas have ever been tried out on a large scale, so the environmental problems are not known. Thus, his conclusion is that it is a very risky possibility. Apart from the environmental concerns, the resource sufficiency is unclear. Clean coal and natural gas technologies take some 10 years to develop and another 10 to introduce on a large scale. The cost is typically 2+ times current energy cost.

Renewable energy, on the other hand, is a technology, which is more or less ready today – ready in the sense that it is a mature technology and that it has a price, which is within a factor 2 of current energy prices. Considering current oil prices, a factor 2 is not scaring anyone away. Wind energy is about 25% more expensive than the present average electricity. In many places in the world, many bio fuels are something like 50% to 80% more expensive than current fuel costs, so all these prospects are within the limit of what is possible. These resources are sufficient. That goes for solar heating too, although it needs seasonal storage, as do solar cells - plus substantial price reduction. Solar cells are today approximately factor 5, i.e. too expensive. Liquid bio fuels are maybe not more than factor 2. Hydrogen is a possible intermediary fuel. Fuel cells need 10-15 years of development and substantial price reduction. So this basically tells you where the fields of development are.

Bent Soerensen then went on to describe more closely the potential of the individual energy sources, emphasising first the high the global potential of biomass both in the south and the north and even at very high latitudes. The reason for that is that it is not only solar energy that depends on how many watts or terra-joules, biofuel can produce. It is a combination of soil type, of water, precipitation and solar resources. All these factors have to come together: In the equatorial region there is lots of sunshine, although perhaps not so much water. In the northern areas, there are better soil types for agricultural production and more water, so the smaller amount of solar radiation is used more efficiently. This map of biomass production distribution (*Figure 5*) is very equitable, therefore biomass is an interesting resource.

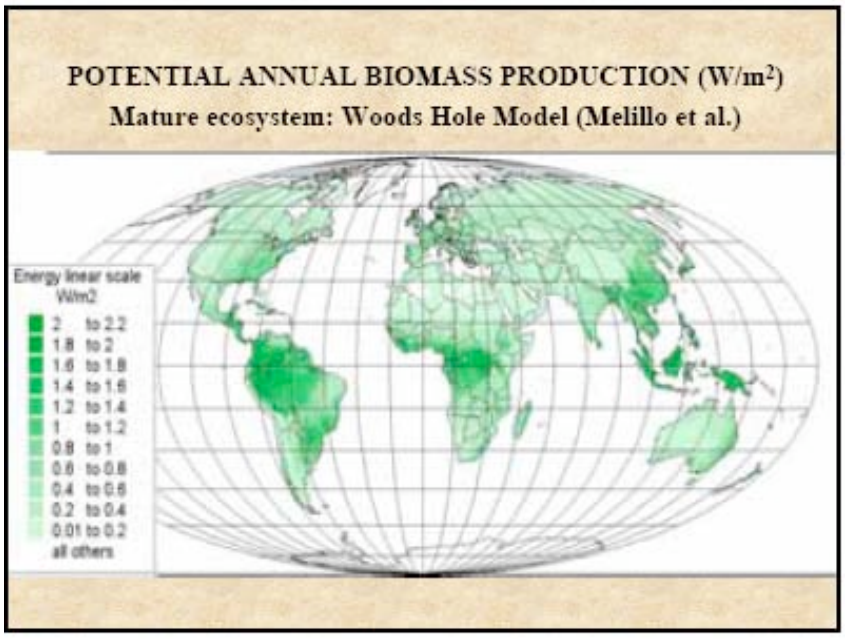


Figure 5: Potential annual biomass production (W/m2)

Below is depicted the food production of vegetable products (*Figure 6 A*), of animal products (*Figure 6 B*), biomass wastes used for energy production (*Figure 6 C*), mainly in Europe, Japan and the United States and wood fuel (*Figure 6 D*). Wood fuel is used almost all over the world today to a certain amount for energy purposes. There is no data for Russia, but they are using wood as well. Biogas (*Figure 6 E*) is used in certain countries: China, India, Northern America, Europe and Australia, where the technology is developed and therefore biogas is used on a fairly large scale in connection with agriculture. Finally, there are liquid bio fuels (*Figure 6 F*), which presently are only used by a few countries: Ethanol in Brazil and the United States, bio diesel in Germany. This is something that has a much higher potential than where we are today.

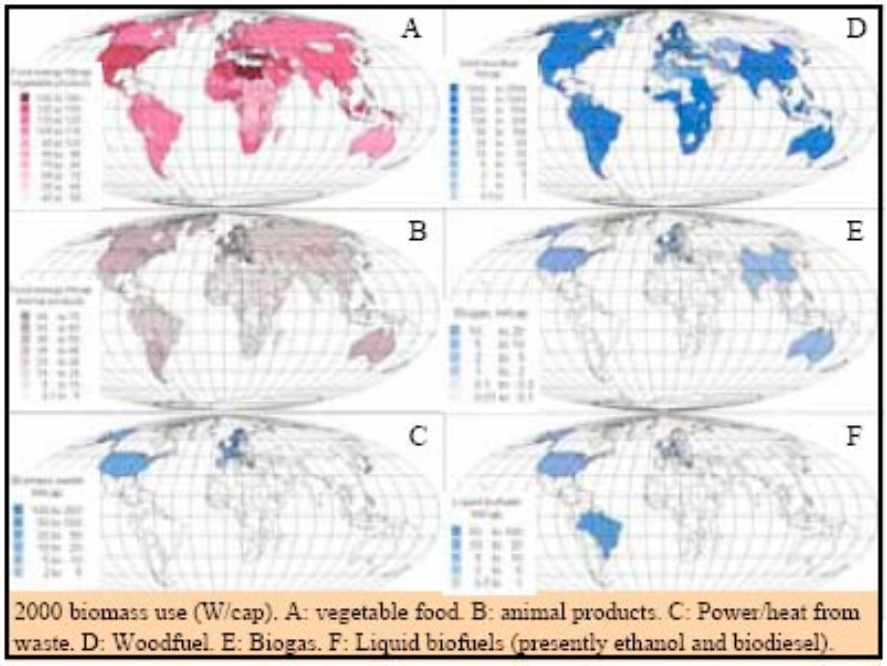


Figure 6: 2000 biomass use (W/cap). A: vegetable food. B: animal products. C: Power/heat from waste. D: Wood fuel. E: Biogas. F: Liquid biofuels (presently ethanol and biodiesel).

According to Bent Soerensen, the general map of wind resources (*Figure 7*) tells us that there seems to be a lot of wind out at sea and not nearly as much on land, although this is only partially true. There are a lot of suitable areas, which are close to the shore with a water depth of less than 20 m, so power can easily be transmitted to the coast. Water depth does not have to be a limitation, because there are offshore wind parks today that are using a water depth of 40 m. All continents have at least some shores that are suitable for offshore wind parks. There are virtually wind resources almost everywhere and we now from the Danish wind parks that they are quite powerful, even with a scale up to 5-10 W/m2.

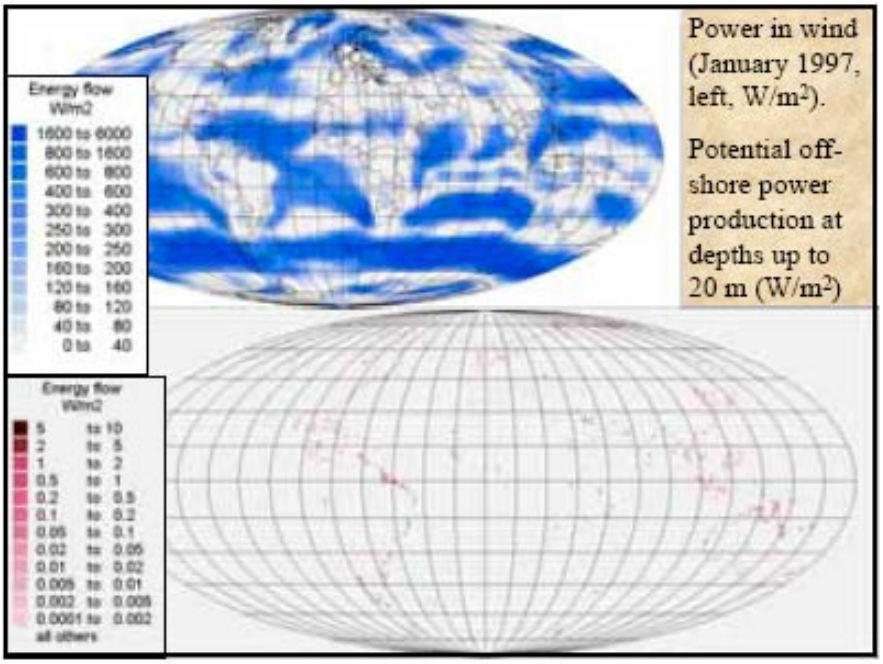


Figure 7: Power in wind, January 1997, W/m^2 (top) and potential offshore power production at depths up to 20 m, W/m^2 (below)

Figure 8 shows two kinds of estimates of potential: One signifies that wind turbines can be situated on farmland with an assumption of one wind turbine per 4-5 farms, if wind conditions are good. The Figure is folding the wind conditions with the amount of farmland suitable for pacing wind turbines. There are areas with large farming production in the U.S., central Europe and Asia, as well as the in southern hemisphere with a large potential for wind. The other estimate pertains to the potential of wind farms on marginal land, which is not used for agriculture, with a need for larger transmission lines. Here there are deserts in the various parts of the world, which have a large potential for wind, if the transmission problem can be managed.

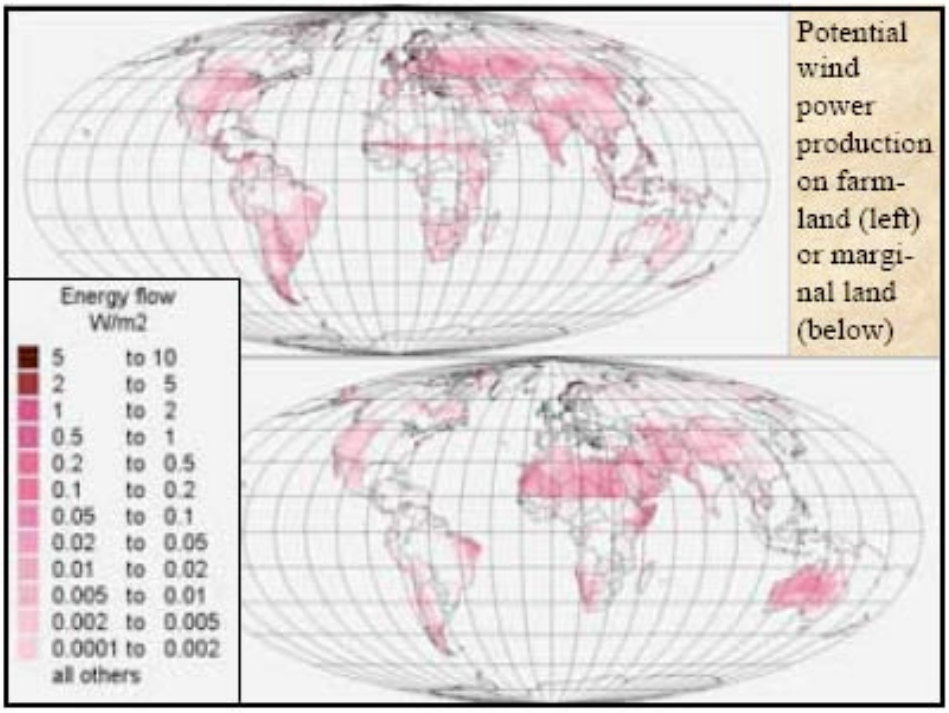


Figure 8: Potential wind power production on farmland (top) or marginal land (below)

Figure 9 depicts the current global wind power situation. The Scandinavian countries, especially Denmark, and Germany, Spain and the United States are the main countries for wind power in the world today. There is a lot of potential, comparing with Figure 8 that is left untapped at the moment. The current growth rate for wind power is over 30% per year.

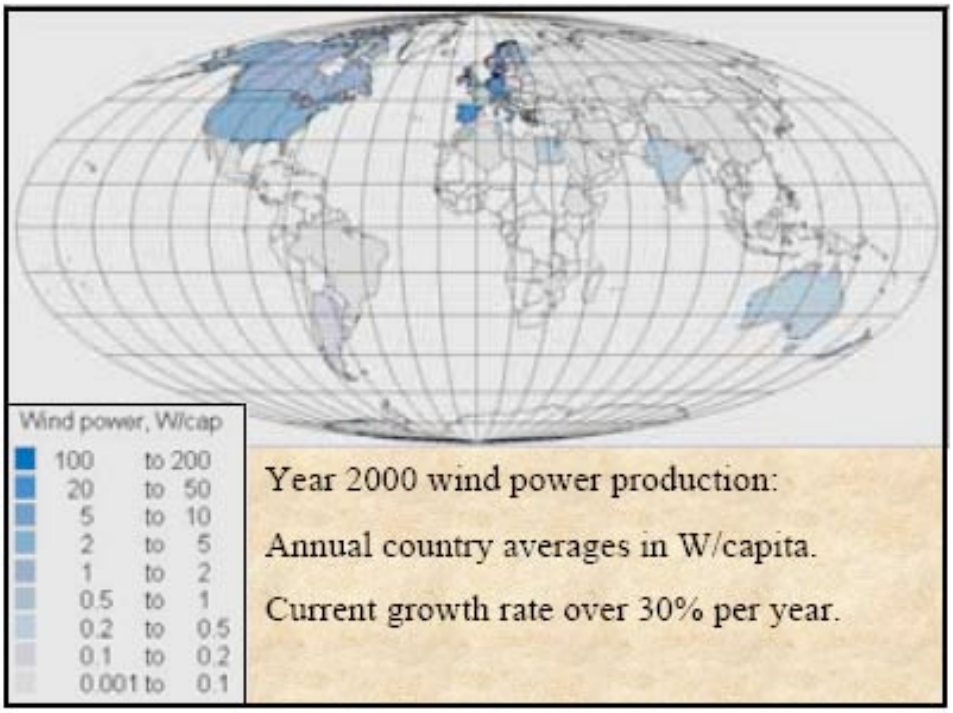


Figure 9: Year 2000 wind power production: Annual country averages in W/capita

Finally, with respect to solar energy for the northern latitude summer, there are areas with not so much sun, but this is not a problem, because nobody lives there. In the wintertime there are large areas, which do not have a lot of sun, bur that is due to measures on the horizontal plane (*see Figure 10*).

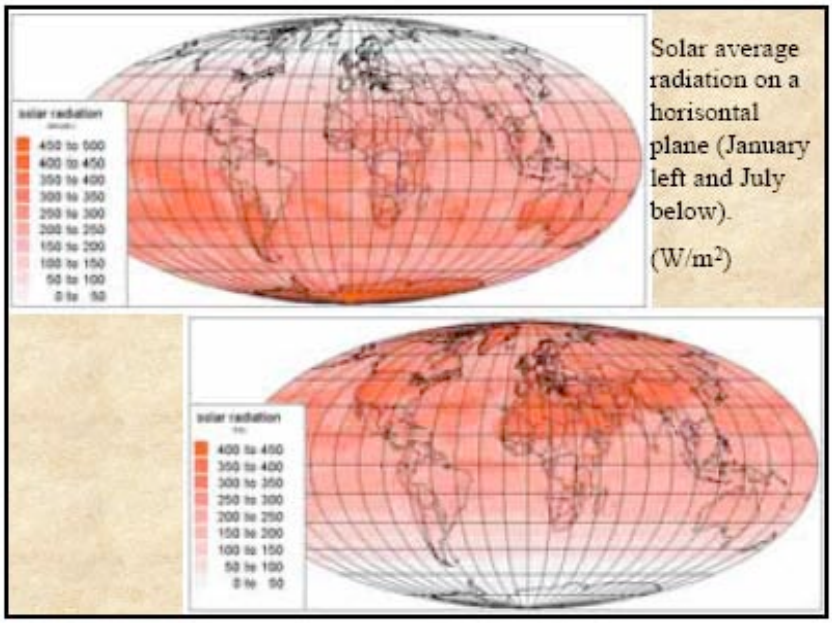


Figure 10: Solar average radiation on a horizontal plane (January) left and July (below), W/m2

In Figure 11, Bent Soerensen folds the amount of sunshine with having suitable surfaces, on which this sunshine can fold. The map is a measure of where buildings with inclined surfaces are facing more or less southwards in order to capture the sun, which is much more beneficial. A good part of Scandinavian countries have solar resources, even in the months of January and February and that is of course because there are a lot of inclined and not horizontal surfaces. Figure 11 shows that not everywhere, but a lot of places there is solar adjacent throughout the year, which can be tapped and surfaces where solar panels can be mounted. If that is not enough, like in the wind case, the marginal areas, e.g. in these desert areas, have a high potential for solar power, because they are usually extremely well endowed with sunshine.

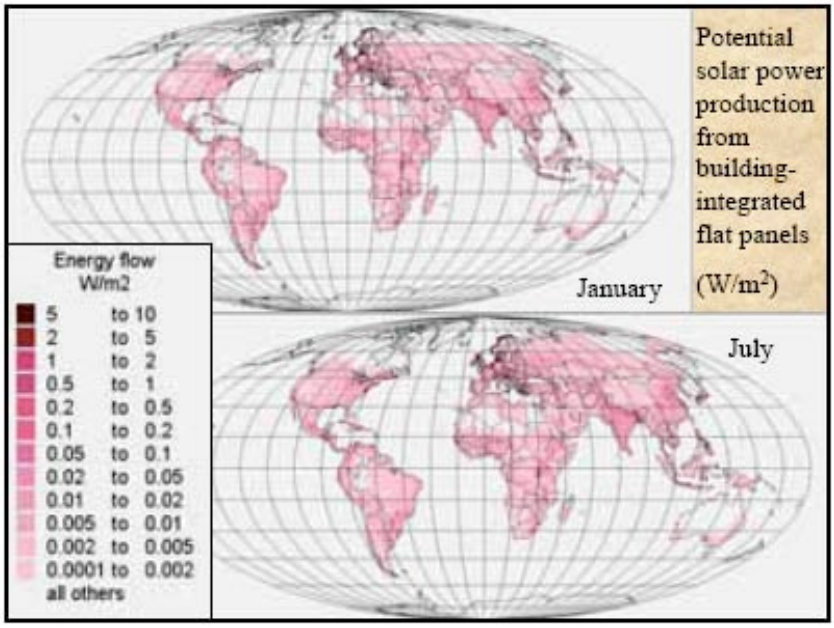
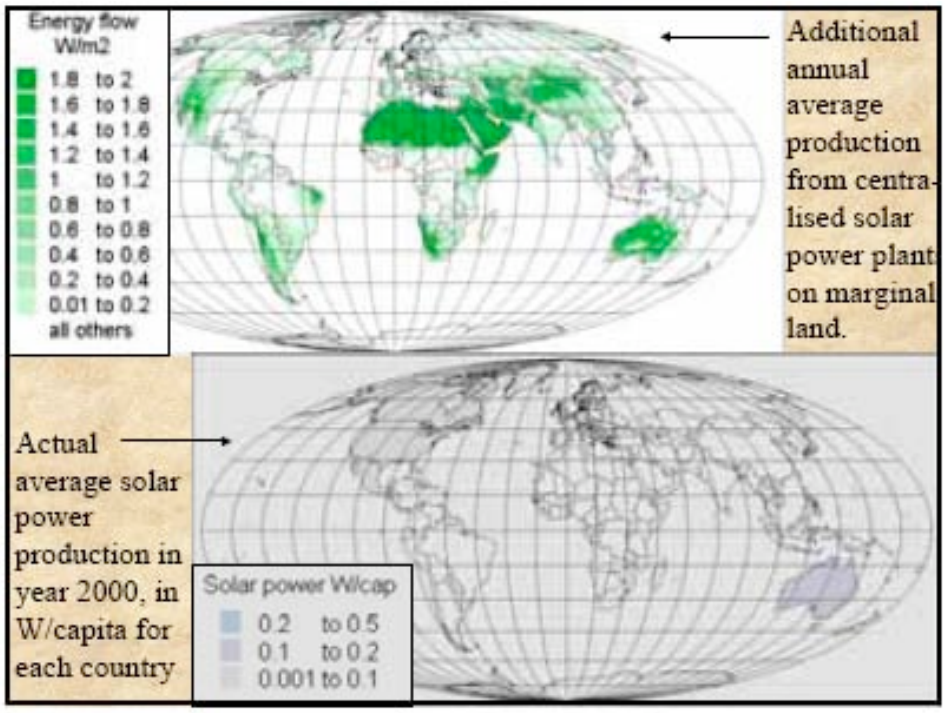


Figure 11: Potential solar power production from building-integrated flat panels, W/m2

What is the actual solar power situation now? Figure 12 shows the global average solar production, which is almost nothing. There is a little bit in Australia and a little bit in Germany and Japan, but that is it. Bent Soerensen's conclusion: Lots of potential untapped.

Figure 12: Actual average solar power production in year 2000, in W/capita for each country



Bent Soerensen ended his presentation with the following statement, indicating that renewable energy could satisfy future energy demand:

"The summary of all this is in this picture (Figure 13) where both decentralised and centralised energy sources have been applied. What I have done here is that I have not used all the available resources, I have used the resources of wind of offshore down to 20 m. depth, I have used the onshore potential on farmland, just a limited number of wind turbines, and I have used very little of the centralised, marginalised land. The same thing with solar: I have used rooftop systems, building integrated solar systems, but I have not used the marginal land.

For biomass, I have used the residues from agriculture, but I have not used the marginal land, where you can grow energy crop. With that it seems that you can fulfil all the needs of the entire planet earth, provided that you have this demand scenario where you have taken into account high efficiency throughout the whole conversion chain. This is the picture. It balances the total amount of renewable energy produced, just balances what have been used plus the losses in transmission, because some transmission is required.

The red area is an area where you produce more renewable energy and the blue areas are areas where you use more energy than you can produce on the same geographical surfaces, all watts per m^2. In India, there are some places here, which are blue, and they need to import energy from elsewhere and the cities in Europe and North America also have to import wind energy and so on from the countryside, because they do not produce enough themselves, but it all balances in this way and actually the trade is very similar to the trade you have today in energy. It is no big problem".

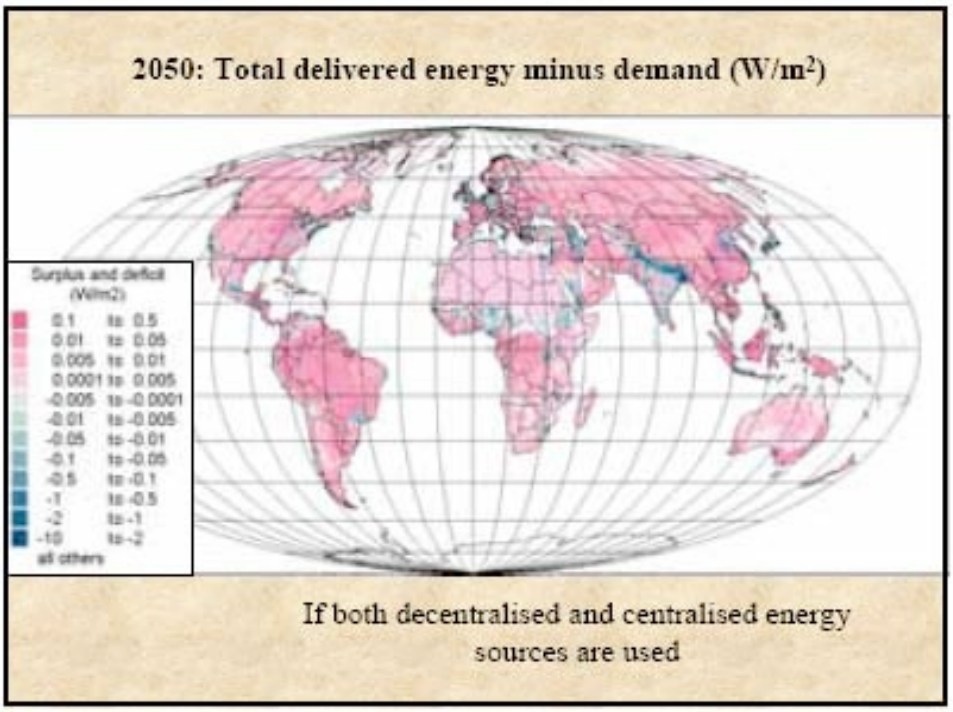


Figure 13: Total delivered energy minus demand (W/m2) 2050

Gunnar Boye Olesen; INFORSE-Europe

10. Gunnar Boye Olesen, International Network for Sustainable Energy-Europe (INFORSE-Europe), made a presentation on **"The possibilities for a Sustainable Energy Transition for EU"**[13]. Within the framework of a global vision for a change to sustainable energy until 2050 (Vision 2050), INFORSE-Europe[14] and member-organisations work on European and national visions for the transition of the energy systems. These visions show the opportunities as well as some of the obstacles to such transitions. The visions combine large increases in renewable energy with strong energy efficiency measures, moderate growth, and a sustainable transport system.

The vision follows the EU target of 12% renewable energy in 2010, and shows how to realise the target of 25% renewable energy in 2020 as well as a transition to more than 95% renewable energy by 2050. The description of the vision includes overviews of the development of the different forms of renewable energy.

The "Windforce10" report (updated in 2002 with the Windforce12 report) gives an overview of how it is possible to realise a large development of wind power in EU-15, following the current trends. The expected development starts with realisation of the 70.000 MW target set by European Wind Energy Association and others. It continues with a target of 220.000 MW wind power for 2020 and a final development to 375,000 MW wind power by 2040, utilising 88% of the estimated potential. Because of the large use of energy efficiency, it is not necessary to use all the full potential of wind power.

For the new EU countries is expected a modest development to 15.000 MW of wind power for the ten countries combined

Solar heating as well as solar electricity is expected to play large roles. Solar heating can cover 10% of the heating demand, and more if seasonal storages are introduced. In Vision2050, the use of solar electricity is expected to increase to about 5.5 m^2/capita in 2050 with an expected annual average output of 100 kWh/m^2. This would give an expected electricity production of almost 200 TWh for EU. Most of the development will take place after 2020.

Until 2010 biomass is expected to grow to about 90% of the target for 2010 in the EU White Paper for Renewable Energy from 1997 for EU-15. While a large part of this development until 2010 is expected to be reached with biomass for heating, it is expected that biomass later will be used for cogeneration of heat and power. It could also be used for production of hydrogen for transport. After 2010 solid biomass is expected to grow up to a sustainability limit of 4100 PJ for EU-15, indicated by the German Advisory Council on Global Change in 2003 (WBGU). This is an

[13] Unfortunately, the presentation had to be cut out of the programme due to lack of time.
[14] International Network for Sustainable Energy – Europe is a network of more than 60 independent organisations working for a transition to sustainable energy, e.g. see www.inforse.org The network also publishes Sustainable Energy News, material for distance education on renewable energy, follows EU-policies, and education for sustainable energy.

additional growth of 10%. The limit for the 10 new countries is set to 1000 PJ, following other estimates.

In addition to solid biomass is included use of biogas of 750 PJ (210 TWh gas), 8 times the level in 2000 for EU-15 and 104 PJ for the 10 “new” countries. Energy forest is expected to be used after 2010, and to reach a level of about 7% of present agricultural land by 2020. In addition to this is included liquid biofuels, to be used in transportation, construction and other sectors. The use of biofuels is expected to reach 330 PJ (91 TWh of fuel) using about 7% of the agricultural land.

For hydropower is expected a 20% growth for EU-15. This is similar to the growth expected until 2010 in the EU White Paper for Renewable Energy, but in the vision it is only expected to be realised by 2020. For the "new" countries is expected a 35% growth.

The use of geothermal energy for heating and electricity is expected to give 700 PJ in for EU-15 and 316 PJ for the new countries, mainly for heating. The graph shows the development of renewable energy for the 25 EU countries according to the sustainable energy vision.

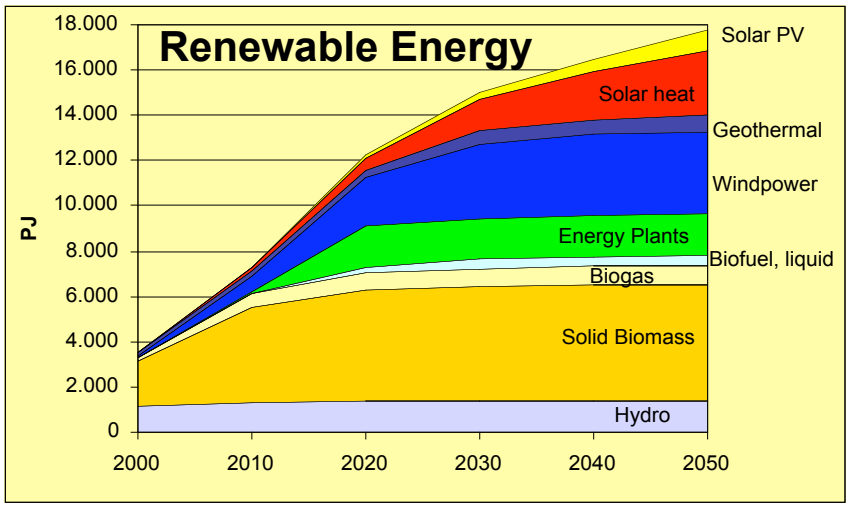


Figure 1: Development of renewable energy in EU-25 2000-2050

The vision is based on rapid growth of energy efficiency to reach an average level in 2050 similar to close to best available technologies today. Most energy consuming equipments will be changed several times until 2050, and if new generations of equipment are made with optimal energy performance, and markets are made to promote the most efficient technology, it will not be a problem to reach today's best available technologies, even though the efficiency gains required are very large, - in the order of 4 times. This will not happen by itself, given that the "natural" technological development (business a usual) is 0.5 -1% per year increase of energy efficiency. It will require concerted action from all stakeholders involved, but indications are that if the market is large enough for each new generation of efficient equipment, it will be a cost-effective development - the extra equipment costs will be offset by energy savings. It will also benefit equipment manufacturers that will get better products, also for the world market. It is, however, necessary to go beyond the conservatism of many market players in this field, and develop a truly enabling market for energy efficiency throughout the society.

For buildings, the situation is different from equipment because buildings often have lifetimes of 100 years or more. For the 15 "old" EU countries, the target heat consumption is 60 kWh/m2 as 2050-average. This will require about a 57% reductions compared with current EU-average. If energy-efficiency measures are included in renovations, such a change is possible.. This could be realised by

• raising building-codes to current low-energy housing levels by 2010,
• require that all major renovations include a major energy-renovation, and
• embark on a major program for passive-houses to achieve that the majority of new buildings are passive houses.

For the new EU-countries is also expected a 57% increase in efficiency for space heating, but at a higher level of specific heat demand.

For transport is assumed that the conversion-efficiency from fuel to transport-work is increased 2.5 times (from current 15- 20% in combustion engine systems to 50% in fuel cell systems; direct electrically driven vehicles have even higher efficiency), and that the vehicles will be equipped with recovering of break-energy. The total efficiency increase is assumed to be in the order of 4 times compared with today's average. For rail, and navigation are “only” included increase in efficiency gains of 40% and 25% respectively.

The growth of energy services, i.e. heated floorspace, transported goods and people and energy consuming production, is expected to reach saturation levels during the 50-year period of the vision. This is in line with the perception that the average Western European has reached a sufficient level of material consumption to satisfy needs. If this is to be realised, it will require that the growth of energy services does not follow the expected economic growth, i.e. that the economic growth is decoupled from growth in material consumption such as energy services. Alternatively the economic growth could come to a halt. For the 15 “old” EU-countries, the growth 2000 – 2050 varies from +40% for use of household appliances to – 35% in road transport. The reduced road transport is not in line with current trends; but it is certainly part of the visions of a large number of NGOs that want to reduce road transport to improve environment, in particular in towns, where most alternatives exists.

For the 10 “new” EU countries is expected higher growth than for EU-15, mainly for service and road transport. For both these sectors is expected a 2.5 times increase.

The energy conversion system should be developed to cater for the changes. The electric grid is likely to increase in importance, because electricity will also be used for transport, directly or via conversion to hydrogen, and some heating will be via the use of heating pumps. The large dependence on intermittent electricity supply make it necessary to have flexible electricity consumption and energy storages in some form. It is expected that use of current storage in hydropower, pump-storage etc. combined with more flexible consumption for heat via heat pumps and for hydrogen can provide the necessary regulation at least until 2040. An obvious possible flexibility in power plants is to combine cogeneration plants with heating-pumps. When there is over-supply of electricity from solar and wind, the plant changes from producing electricity to consuming electricity, while still giving the heat users the necessary heat, and without loosing efficiency from turning to single production of heat or electricity. From 2040 there might be need in addition for electricity storages, e.g. as chemical storages.

For the "new" EU countries the use of wind power is expected to be less, and the need for electricity, leading to a lower fraction of intermittent supply, and less need for electricity storages.

The vision will lead to decreasing primary energy demand as the efficiency in end-use and in the energy conversion system is larger than the increase in demands for heated houses, electric appliances, etc. The vision includes an increasing reliance on electricity, and as an effect the electricity supply is not reduced considerably; but a large part of this is assumed to be used for transportation. The graph below depicts the development of the Total Primary Energy Supply of the EU, if we follow the vision.

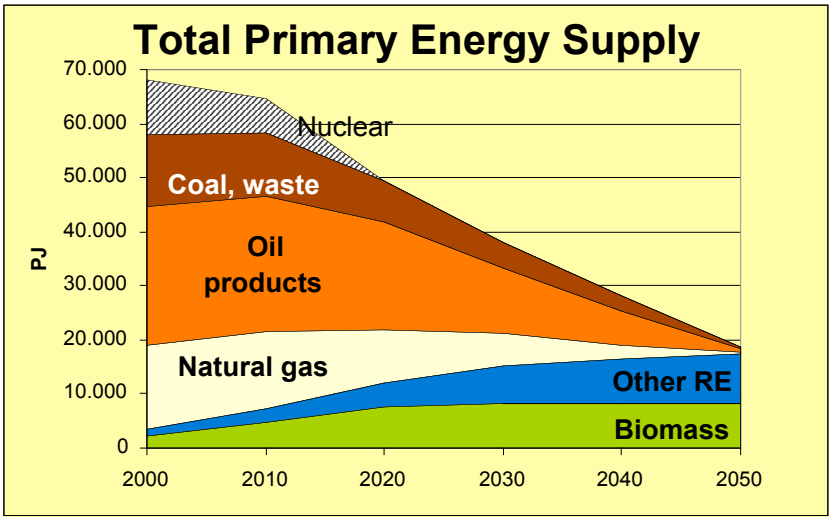


Figure 2: Development of the total primary energy supply of the EU 2000-2050

The graph below shows the development of Electricity Divided in Supply in the EU according to the visiom the vision.

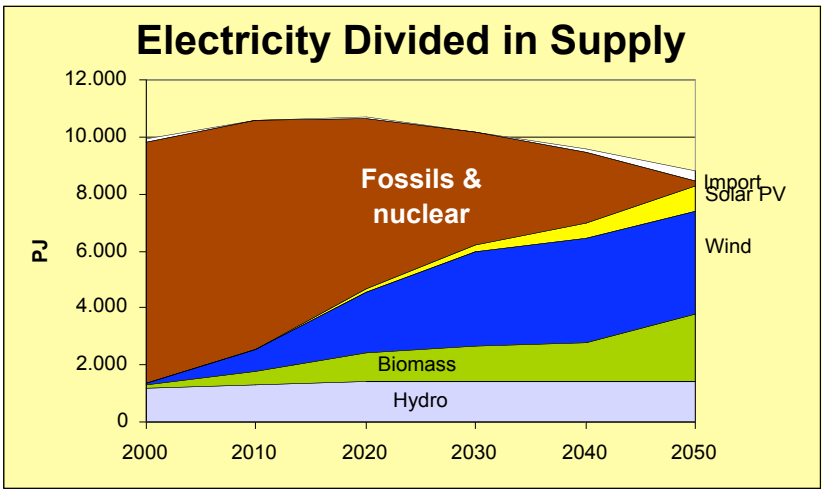


Figure 3: Development of electricity divided in supply in the EU 2000-2050

The reduction of CO_2 from energy use is expected to follow the 8% reduction target for 2010, followed by a 30-40% reduction in 2020, more than 50% reduction in 2030, and more than 95% in 2050. The graph below shows the development of CO_2 emissions in the vision.

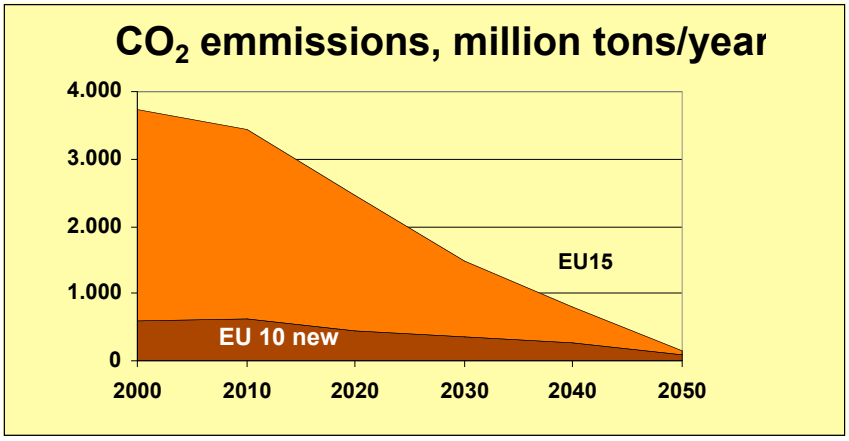


Figure 4: Development of CO2 emissions in the EU 2000-2050

Nuclear energy is expected to be phased out as the current nuclear reactors are stopped because of age, safety problems etc. In this vision, this is expected to happen until 2020. For fossil fuels are expected a gradual phase-out of coal-use until, a slow but increasing phase-out of oil use till 2050 and a growing gas consumption until 2010, followed by phase-out until 2050. Gas networks are expected to have decreasing importance. They might play a role for transportation of hydrogen or biogas, but probably not for long-distant transport.

Energy trade is expected to be much less than today, and if the efficiency potentials are realised EU-15 might not be an energy importer after 2040. The new EU countries have lower potentials for wind power, as well as for wave power and other ocean energies that could supplement wind energy, but can also be sufficient or almost self-sufficient with energy by 2050, depending on the level of efficiency increase and growth.

The energy efficiency measures are expected to be cost-effective, either because they are already cost-effective or because they can become cost-effective if implemented on a large scale. The renewable energy technologies are expected to become cost-effective in general before their main implementation phase. Solid biomass is cost-effective today and it is therefore given priority 2000 - 2020. Wind power is cost-effective today in some sites, while it is expected to become cost-effective after 2010 in most relevant sites (main implementation 2010-2020). Energy crops and small-scale use of solar heating are both expected to become cost-effective after 2010 if the current trends continue (main implementation respectively 2010-2020 and 2010-2040). Solar for district heating and industry as well as PV is expected to become cost-effective after 2020 (main implementation after 2020). Biogas is already cost-effective today, if additional benefits are included such as improved fertiliser qualities of the degassed manure.

The replacement of mainly imported energy with renewable energy and energy efficiency will give considerable employment benefits, in particular because most of the solutions are cost effective.

The conclusion of Gunnar Boye Olesen's presentation was the following:

"A transition to sustainable energy as described in this vision can be introduced in a number of ways; but it will not happen by itself. It will require efficient policies and measures for energy efficiency, renewable energy, and a sustainable transport system. Proven measures already exist for this. They include internalisation of internal costs with energy taxes, awareness raising, quality and efficiency labelling, minimum efficiency standards, feed-in tariffs for renewable electricity and gas, most energy-related R&D allocated for sustainable energy, land-use planning to minimise transport, etc. Such measures have shown their abilities to give the necessary trends of change for specific technologies in individual countries, sustained for more than a decade. If these measures are used in a concerted way in the EU countries for the period until 2050, there can be little doubt that they can bring about the transition to sustainable energy".

Tarjei Haaland; Greenpeace

11. Tarjei Haaland, climate and energy campaigner from Greenpeace gave a presentation on **"Towards CO2 reduction without nuclear power in the Nordic countries"**. He started by stressing that it is a clear Greenpeace objective to combat both climate change *and* nuclear power. Nuclear power - with all its unsolved and unacceptable problems – should certainly not be part of the solution in the fight for avoiding dangerous climate change. It would therefore be a central question to ask how and how quickly nuclear power in the Nordic area - Sweden and Finland – can be phased out in parallel with achieving the substantial reductions in CO_2 emission necessary to keep the global warming below 2 degree C compared to pre-industrial time. For industrial countries this means reductions in CO_2 and other greenhouse gases of at least 30% in 2020 and 80% in 2050.

Tarjei Haaland explained that Greenpeace for a couple of years has worked closely with the Danish energy consultant Klaus Illum on a project - *The Nordic Energy Systems Analysis Project* - to get reliable answers to this question through scenarios made by an extended version of Illum's SESAM model to include also Sweden, Norway and Finland.

The SESAM model of the Nordic energy system is a comprehensive, completely integrated physical model of: (1) *The end-use system*, i.e. buildings with inventories of electrical appliances, industries and production processes, means of transportation. (2) *The energy conversion and transmission system*, i.e. power and cogeneration stations of various types, boiler stations and individual boilers, units for the conversion of electric power to chemical, energy for use in vehicles, e.g.. electrolyses units, and (3) *the system of energy sources*, i.e. hydropower, windmills, PV-panels, biomass, fossil fuels etc..

The model is a multi-scenario model, which facilitates the comparative analysis of a wide spectrum of alternative scenarios for the future development of the energy system in question. The system consists of a multitude of local systems (big and small), interconnected by a common electric grid.

The aim of the *The Nordic Energy Systems Analysis Project* is to explore a range of different scenarios, so as to find possibilities of developing a Nordic energy system which can satisfy the future energy needs of these countries with low CO_2 emissions and without nuclear power.

Tarjei Haaland then went on to present growth assumptions for both the scenarios described below, emphasising that it was not a low growth scenario.

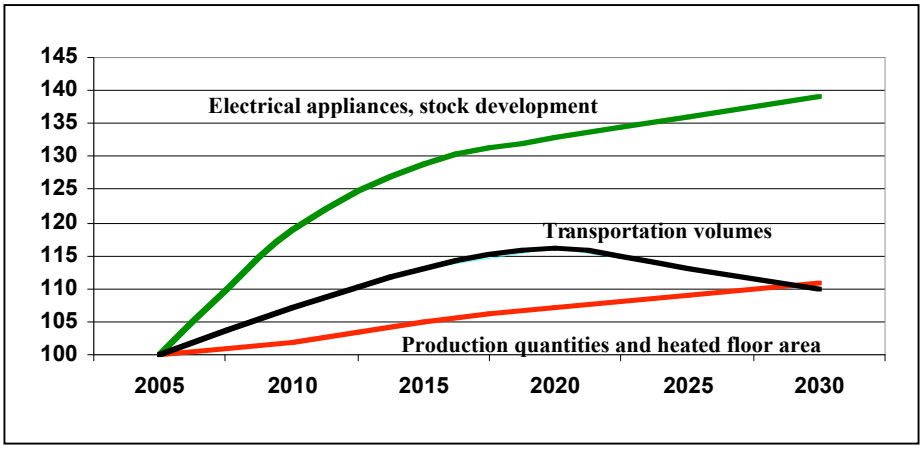


Figure 1: Growth assumptions

He also presented a figure on crude oil price development for case 1, 2 and 3, stressing that the price of natural gas and coal is assumed to follow the crude oil price.

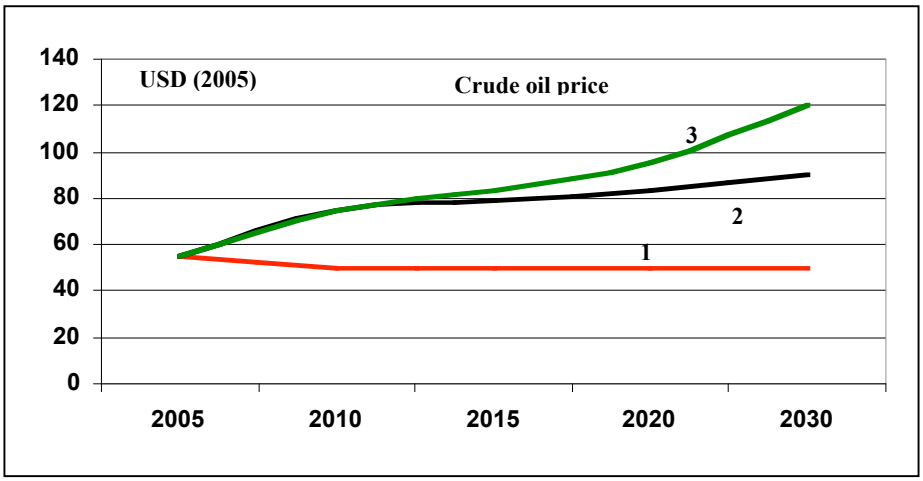


Figure 2: crude oil price development for case 1, 2 and 3

The two Scenario examples – A and B – he explored, were the following:

Scenario A: (1) No investments other than regular reinvestments in worn out equipment are made. (2) Nuclear power stations remain in operation. (3) Only electrical appliances are replaced by more energy efficient models along the way.

Tarjei Haaland stressed that this scenario was a fictional scenario because it results in growth in CO_2-emission and oil consumption, which is not realistic.

S*cenario B:* (1) Extensive investments are made in the energy system infrastructure, renewable energy sources, improved weathering of buildings, etc. (2) Nuclear power is phased out and wind power is phased in. (3) The Kyoto/EU-obligations regarding CO_2-emission for 2010 and 2020 are met. (4) Substantial CO_2-reductions are achieved by 2030 and (5) oil consumption is substantially reduced.

To exemplify phase-out of nuclear power in Sweden and Finland: The 10 Swedish reactors currently in operation are closed down according to the plan already decided upon up by the Swedish government in 2004. In Finland it is a little more complicated, because a 5th reactor is under construction. So in the scenario the 5th reactor is put online in 2010, while at the same time two of the oldest are closed. Nuclear power in Finland will finally be phased out in 2030, because it will then no longer be needed in the electricity production (*for graphic figures on the nuclear phase-out plans, please see Tarjei Haaland's presentation on the conference website*).

The changes in transportation technology and means of transportation specified in scenario B comprises lighter vehicles, more energy-efficient engines, electric public transport (trams, trolley buses, trains, etc.) and electric battery driven cars. It also comprises fuel cell driven buses and cars (electric power converted to chemical energy, e.g. hydrogen, for fuel cells), more public transport by modern, comfortable means and more goods transported by rail and ship.

With respect to power generation in Scenario A and B, Tarjei Haaland introduced the following figures:

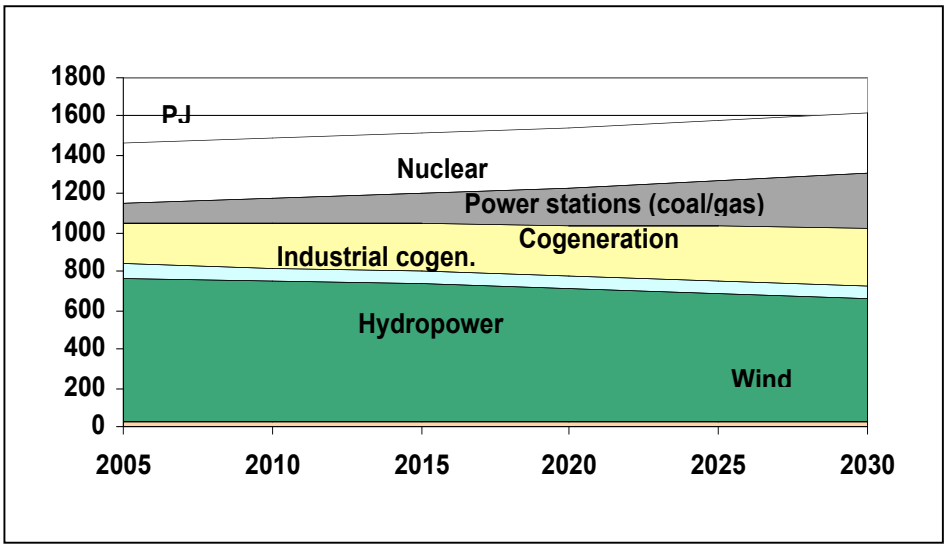


Figure 3: Scenario A - power generation

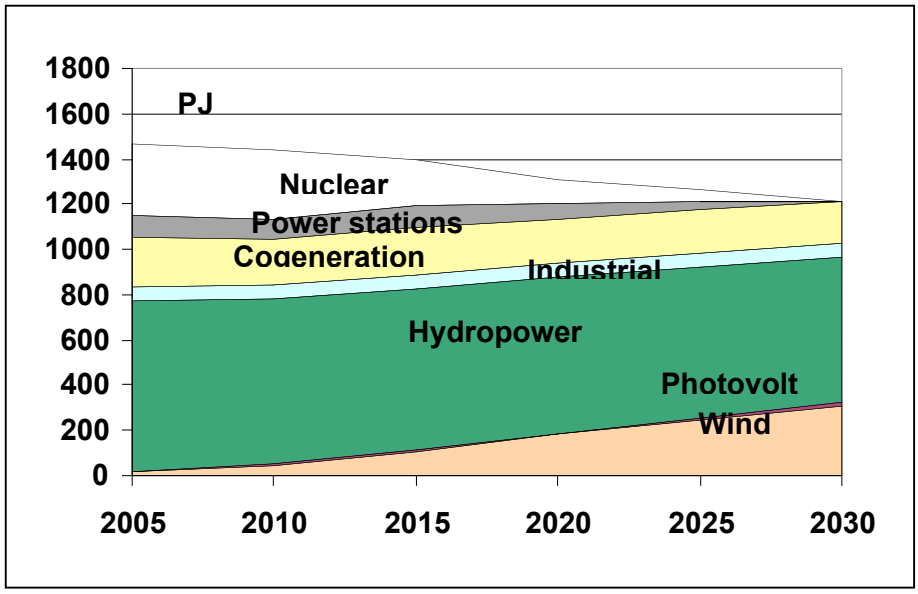


Figure 4: Scenario B - power generation

According to Tarjei Haaland, the assumed phase-in of wind in the scenario below is not extremely ambitious. We talk about 200-400 MW per year in each of the 4 Nordic countries in the next 25 years – with the highest rate in the last 15 years of the period. In 2030 in total 29 GW installed producing 85 TWh/year.

Table 1: Wind phase-in

Wind phase-in[15]	Denmark	Norway	Sweden	Finland	Nordic
Wind power increase 2005-2015 in TWh	8.2	5.6	4.6	6.0	24.4
MW per year in 2005-20015	302	205	170	220	900
Wind power increase 2015-2030 in TWh	11.7	11.3	14.4	18.1	55.6
MW per year in 2015-2030	287	277	354	444	1365

That means for Denmark that wind in 2015 deliver 35% of the electricity consumption – the same as recommended by Danish Wind Industry Association in "Vind eller forsvind". And for all 4 Nordic countries together that wind covers 15% in 2020 – a little more than projected for OECD Europe in Windforce12.

The amount of electricity used in the 4 Nordic countries for electric heating - at least 73 TWh/year – equals around 83% of all electricity produced by nuclear power in the Nordic. Electric heating is

[15] With an assumed mean capacity factor for wind of 31%.

especially widespread in Norway and Sweden – and is one of the main reasons why the electricity use per capita in households in Norway is 4.2 and in Sweden 2.5 times higher than in Denmark.

It is worth also remembering that "Linie 2" that won the Swedish nuclear referendum back in 1980 on their vote list promised that direct electric heating in new houses will be stopped. In spite of this electric heating in Sweden increased 100% in the next 10 years in parallel with putting on line the last 4 reactors (F2, R4, O3 and F3))

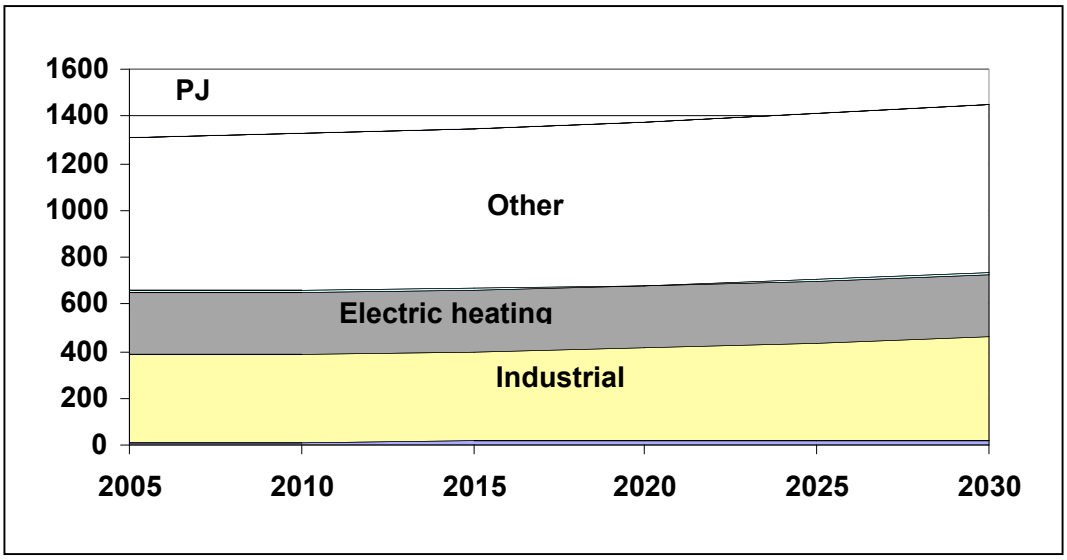


Figure 5: Scenario A – electricity consumption

So one important change in scenario B is a gradual conversion of electric heating – especially in Norway and Sweden.

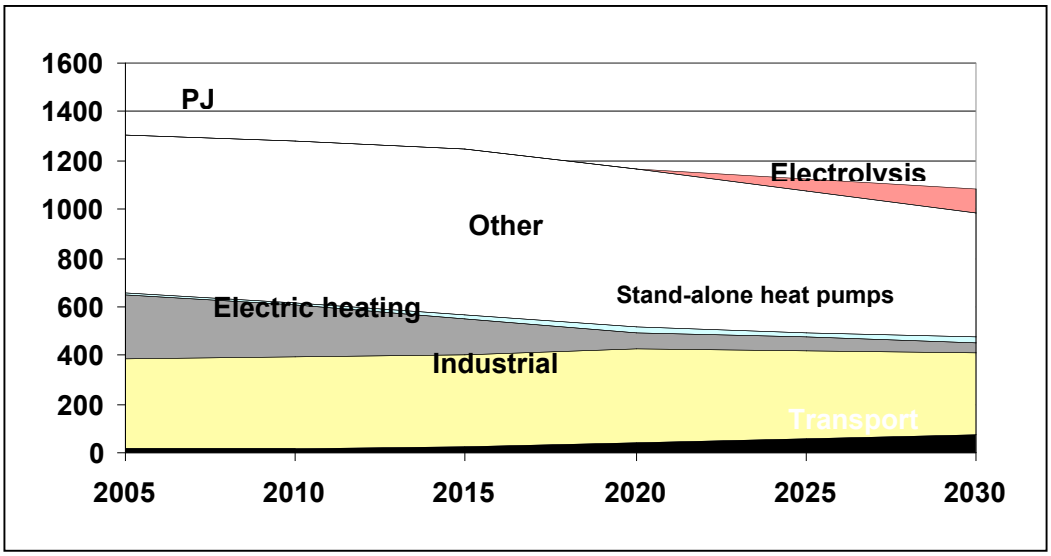


Figure 6: Scenario B – electricity consumption

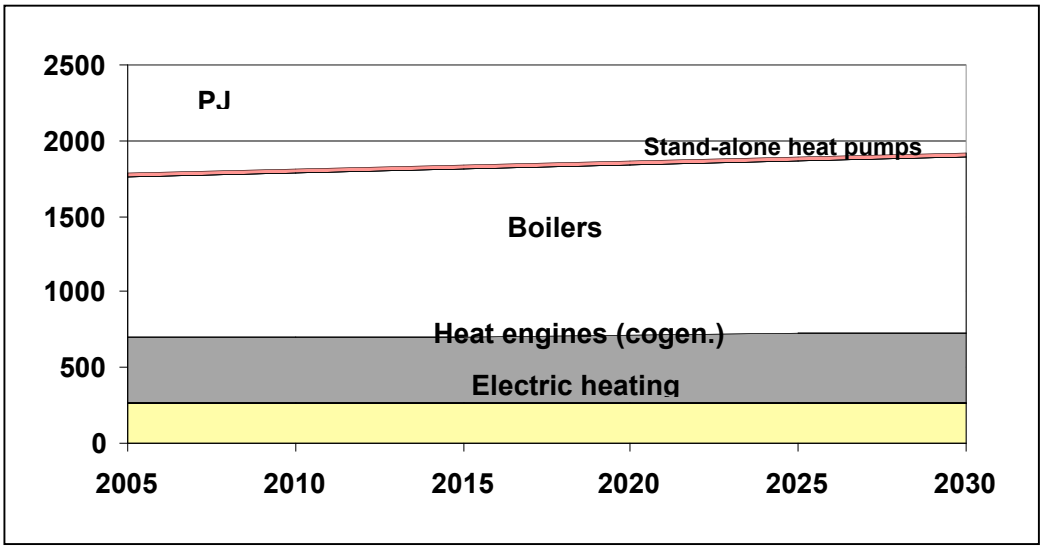


Figure 7: Scenario A – heat consumption

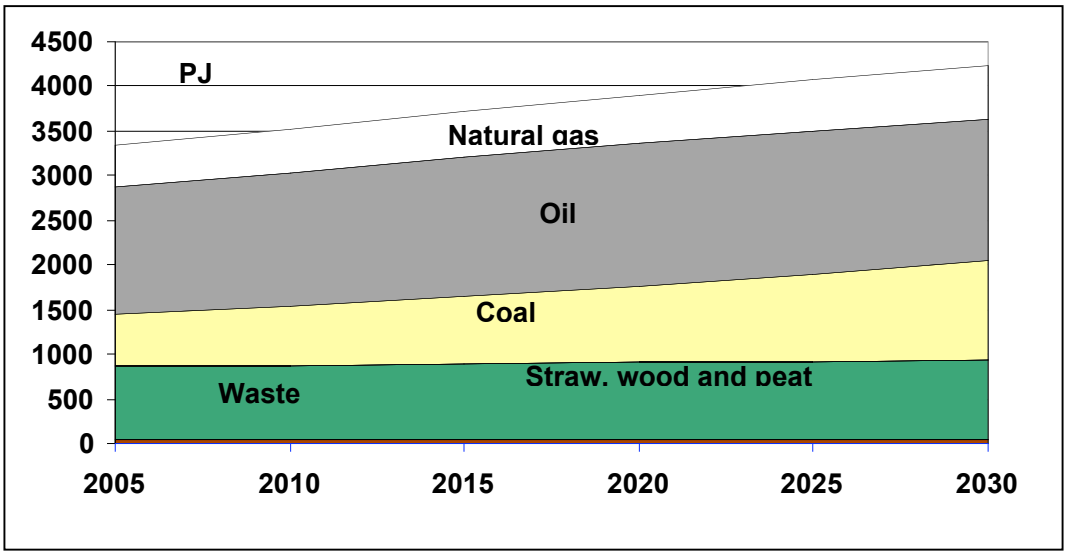


Figure 8: Scenario A – Nordic fuel consumption

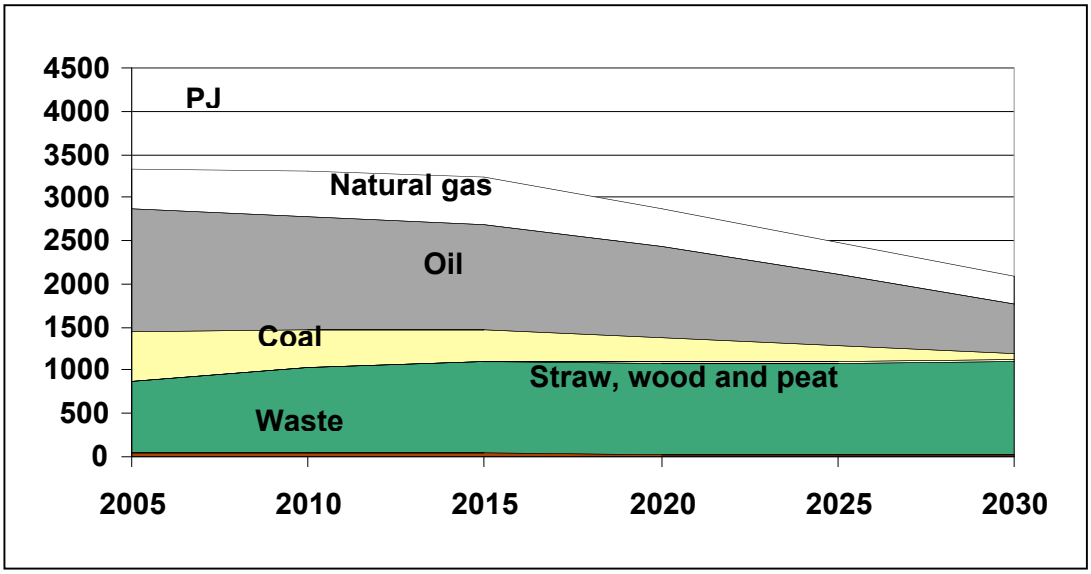


Figure 9: Scenario B – Nordic fuel consumption

With respect to the CO_2 emissions in the scenario: In 2020 we want at least a 30% reduction of CO_2 emissions in the industrialised countries. EU talks about a reduction of 15-20% but that is in our opinion not enough.

If you look at the Nordic countries, together they live up to the target by reducing their emissions at home. In the scenarios Sweden does more than it should, Finland a little less and Denmark and Norway what they are expected to do.

So all in all it adds up, even without using the Kyoto mechanisms (*for graphic figures on CO_2 reductions in specific Nordic countries, please see Tarjei Haaland's presentation on the conference website*).

Figure 10 illustrates that it is technically possible to phase-out nuclear power in Sweden and Finland within 20-25 years – and at the same time reduce Nordic CO_2 emissions from the energy and transport sector in accordance with both Kyoto-targets in 2008-12 and the much more substantial reductions needed in 2020 and 2030.

In addition, it leads in 2030 to nearly 60% reduction in Nordic oil use – and 55% reduction in the use of diesel and gasoline in vehicles compared to now.

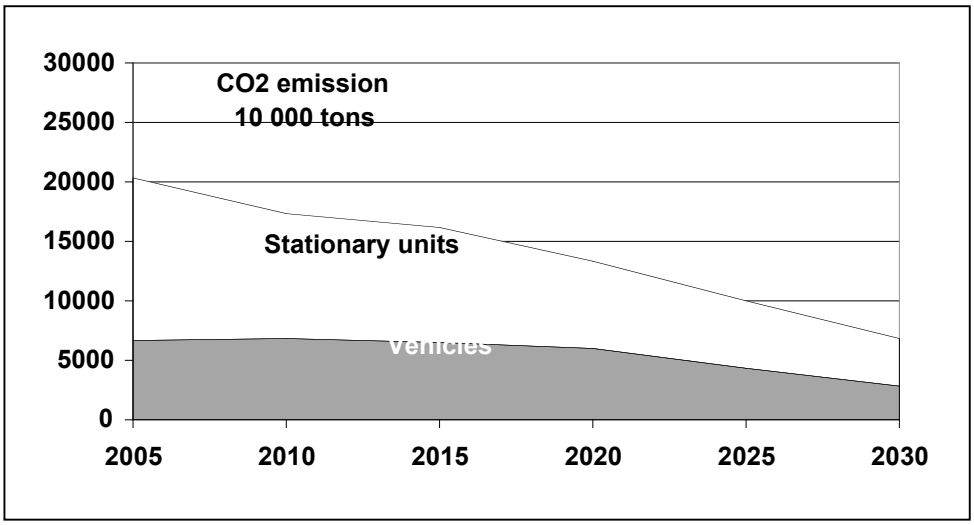


Figure 10: Scenario B – reductions in Nordic CO2 emissions

Tarjei Haaland continued by outlining the financial costs of the scenarios and stating that it may come as a surprise to many people that the total costs in scenario B – investments, maintenance and depreciation costs and fuel costs - needed in the next 25 years (2005-2030) are a little less than the total costs needed in scenario A – with moderate oil price growth (price case 2: $60 to $90/barrel) (*for graphic figures on the total costs in scenario A and B, please see Tarjei Haaland's presentation on the conference website*). In addition the accumulated capital in 2005-30 is 3 times higher in scenario B – and the annual costs in 2030 clearly lower even in the low oil price case! In other words scenario B is a much more both environmental and economical sustainable energy system than A.

Table 2: Investments and reinvestments made in the B-scenario in € Billion

Windmills	32
Photovoltaic	18
Solar absorbers / Biogas plants	8
Cogeneration stations (some with heat pumps), and individual mini-cogeneration	91
Conversion of electric power to chemical energy, e.g. by electrolysis	5
District heating networks	10
New heating installations in buildings (including the replacement of electric radiators)	64
Improved insulation of buildings	63
Total	**291**

According to Tarjei Haaland, what happens in the future depends on whether or not our societies exploit the technological opportunities for the development of a sustainable energy system. If the transition to a sustainable energy system does not take place in a goal-directed manner in accordance with an appropriate development strategy, it will take place in an unforeseeable and probably disastrous manner. This is not to say that economy and the market is not important for the implementation of a certain development strategy. It is indeed.

But only when a certain strategy has been politically decided can new particular markets for infrastructure investments be opened. Also the market regulation mechanisms appropriate for the implementation of the strategy (e.g. energy efficiency standards for electric appliances and vehicles; CO_2 taxation and other environmental taxation) should be assessed and implemented in a goal directed manner. It is vital to understand that the so-called market forces – oil price, CO_2 price and electricity price – will not secure that the investment flow in the energy sector will lead to real CO_2 reductions. And if it does it will not be large enough reductions.

The Danish government "Energy strategy 2025" from June 2005 illustrates this clearly: In the government's *low-low projection* with assumed oil price of 20 $/barrel and CO_2 price of 6,5 €/ton, CO_2 emission from the energy sector (including transport) will increase nearly 10% in 2008-12 compared to 1990 – and will in 2020 still be nearly 8% more than in 1990.

Even in its *high-high projection* with oil price increasing to 50$/barrel and CO_2 price increasing to 40 €/tonnes in 2025, CO_2 emission will in 2008-12 be the same as in 1990 - and only 18% below 1990 emission in 2020.

Tarjei Haaland ended his presentation the following way:

"In conclusion, I will appeal to politicians to use the sort of scenarios that are presented today to explore and analyse possible road maps and investment plans to secure development of low CO_2 emitting, nuclear free and sustainable energy systems in the Nordic countries. Nordic cooperation and coordination in this respect is clearly beneficial. Sitting back and leave it to the market forces is completely irresponsible. We need politicians that take back energy planning power, set up targets and timetables, and decide on the measures and market regulations needed. There is no time to waste".

Second Keynote Speech: Christian Kjaer; The European Wind Energy Association

12. The second keynote speech of the day - **"A level playing field for power in EU"** - was delivered by **Christian Kjaer**, policy director of The European Wind Energy Association. He started by saying that he would speak remarkable little of wind energy and that this probably would be the one presentation he would give where he would speak the least about this subject. That was the reason he had changed the title of his presentation from "A level Playing Field for Renewables in the EU" to "A level Playing Field for Power in the EU". He then proceeded to lay out his main thesis: That renewables should not be given any special treatment and that there was no level playing field for the power producers in the European electricity markets. If there were, wind power and renewables would not be in need of special treatment. His presentation was intended to show that free competition was a myth and that it – as things are now - would not be implemented in 2007 either, when market liberalisation is expected to give all consumers the ability to choose their energy supplier. The existing distortions favoured the incumbent energies and disfavoured new entrants in the European electricity markets. So the focal point would be to get these distortions removed.

According to Christian Kjaer, if one goes back to the origin of the European Community, two of the three founding Treaties have been based on energy, so one could say that the whole European system is based on energy. The European Coal and Steel Community expired in 2002 – it does not exist any longer - but that does not mean that coal is not subsidised. As mentioned in a lot of other presentations, the Euratom Treaty has no expiration date. The interesting aspect of the Euratom Treaty in the context of competition distortion is the fact, that it contains no specific provisions for state aid, which means that the normal rules of the European Community for state aid control cannot be applied to the nuclear power sector. Christian Kjaer did not understand why.

He then said the following:

"The Euratom Treaty also places a privileged status for state funding on one source of energy, in fact on one whole sector of the economy. Why? The European Court has never clarified the legal relationship between Euratom and EC state aid rules. Why? There is no democratic control through the European Parliament on matters relating to Euratom and loans for nuclear power can be granted without consulting the European Parliament. Why? In fact, nuclear technology has its own Treaty, the Euratom Treaty, which singles out one energy source – one industry sector - that is treated differently from all other sectors in the Community. Why? This is completely nonsense. What Euratom does is that it prevents any real competition in the internal electricity market by giving one third of the EU power supply special privileges".

If renewables could be granted the same special privileges the people in this industry would of course be happy, but that is not what they are asking for. What they are asking for is to have these privileges removed. That would be the first step towards a level playing field for new entrants in the European power markets.

Christian Kjaer then proceeded with a description of historical developments in the European electricity market: Prior to the 1980ies the power sector was basically determined by national monopolies, which were given a mandate to fund anything they wanted to over the electricity bills. In the 1990ies the European Commission challenged the existence of these power monopolies, because it felt that they were contrary to the EC Treaty rules on competition and cross-border movement, so an Electricity and Gas Directive was introduced in 1996, in 1998 another for gas and in 2003 the EU provided common rules for electricity and gas, i.e. a second package for the liberalisation of the European electricity market. Since 2001, the Commission has been looking into how competition is developing within this common market for electricity and gas.

By quoting among others 4 benchmarking reports from the Commission, he established that the way market opening is undertaken by Member States is leading to significant distortions of competition, a lack of a level playing field between companies from different countries in the European electricity markets and is failing to lead to the development of a competitive, integrated market.

His preliminary conclusion on this subject - as is the one of the Commission - was that *"it is becoming clear that the main problem for electricity in the coming years will be the issue of market dominance at national level and the inadequate level of interconnection between Member States"*.

Quoting the Commission's 4th benchmarking report from January 2005[16], he listed the four main reasons for lack of competition: (1) Lack of cross- border transmission links, (2) existence of dominant, integrated power companies, (3) biased grid operators and (4) non-existence of liquid wholesale power markets. According to him, the Commission sees market concentration and dominant incumbents as "the most important obstacle to the development of vigorous competition".

Market concentration continues to be one of the main barriers to effective competition in the European power markets. Analysis of merger and acquisition activity in recent years further suggests that the problem has been increasing throughout the liberalisation process. The level of dominance is even increasing as rules and practises continue to support the incumbent European generators and technologies and are encouraged by some Member States as utilities are built up to become national champions or are becoming part of a handful of European utility oligopolies. Hence, the trend of dominant players in the European electricity markets is still continuing: In EU-15 in the last years, the percentage share of the three largest generators in Member States has increased. The 6 largest power companies own 60% of EU generation assets and 80% of the infrastructure. In 12 of the EU-15 Member States, the top 3 utilities control more than 2/3 of the market. The average share of the power generation market has increased from 73% to 76% (March 2004)[17]. In 2000-2003 the seven largest European utilities invested €80 billion in mergers and acquisitions throughout Europe. In addition the ownership of grids by utilities continues, known as vertical integration, gives vertically integrated utilities a competitive advantage over other generation companies, especially new entrants to the market.

[16] COMMISSION OF THE EUROPEAN COMMUNITIES, REPORT FROM THE COMMISSION, *Annual Report on the Implementation of the Gas and Electricity Internal Market*,{SEC(2004) 1720}, Brussels, 5.1.2005, http://www.ewea.org/fileadmin/ewea_documents/documents/newsletter/2005/BB_05_1/4th_Benchmarking_Report.pdf

[17] DG TREN Draft Working Paper Third benchmarking report on the implementation of the internal electricity and gas market, Commission Of The European Communities, Brussels, 01.03.2004

According to Kjaer, quoting former Competition Commissioner Mario Monti, competition in power and gas markets is different from any other market: Market power can already be present where parties have market shares which would not be problematic in other sectors of the economy. The power and gas markets have a particular structure, which facilitates both collusive behaviour and exercise of market power.

Hence, generation must be legally separated from transmission, because transmission is a natural monopoly that must be separated from production for the following reasons: (a) Vast possibilities for cross- subsidies, (b) network charges for third party access are not transparent, (c) disproportionately high balancing charges, (d) disproportionately high administration charges, (e) third party entrants paying for upgrading grids owned by their competitors and (f) no full ownership unbundling requirements in the Directives. E.g. (g) vertical integration was single largest motivating factor for top 40 energy mergers and acquisitions in 2003.

The EU-25 power production mix in 2002 was the following:

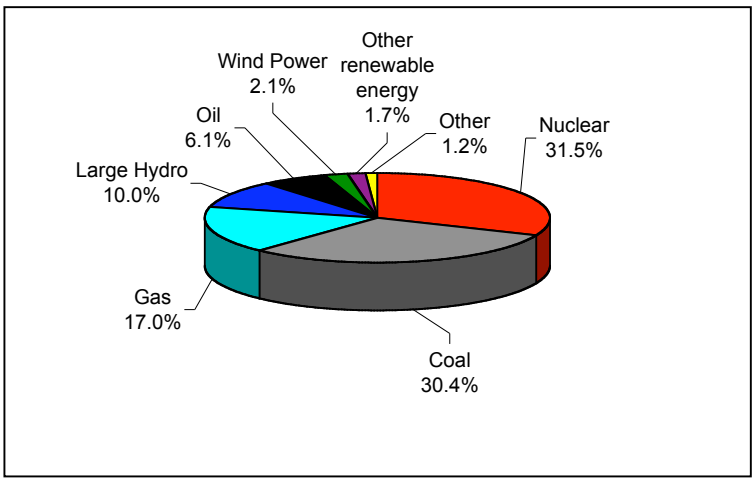


Figure 1: EU-25 power production mix in 200218

New renewables (excluding large hydro) account for some 4% of EU-25 electricity production, including 2.1% wind power. The remaining 95% of the European power supply is based on predominantly nuclear, coal, gas, large hydro and oil.

Allocation of energy subsidies confirms that there is no level playing field for power in Europe. Christian Kjaer used the following statistics to document this fact:

Subsidies for RD& D budgets in IEA countries (IEA figures) 1974- 2002: Nuclear fusion: $138 billion (47%), fossil fuels: $ 37 billion (13%), nuclear fission: $31 billion (11%), renewable energy: $24 billion (8%) of which wind energy: $3 billion (1%). 1987- 2002: Nuclear fusion: $53 billion (40%), fossil fuels: $16 billion (12%), nuclear fission: $15 billion (11%), renewable energy: $18 billion (14%) of which wind energy: $3 billion (1%).

[18] The figure is put together by EWEA on the basis of information from the European Commission, *COM(2004)366, Eurostat* og *IEA World Energy Outlook 2004*.

Since 1980, $100 billion was spent on coal subsidies in Germany alone. In 1999 the average subsidy per German coal miner was $70,000. In 1999 the average subsidy per Spanish coalminer was $60,000. 1991- 2002: 65% of EU Member State R&D funds went to nuclear.

A 2001 European Parliament report *"Energy Subsidies in the European Union"* summarised the amount of *energy subsidies in EU 15 and Member States:*

Solid Fuels >€12,000 million pa
Oil and Gas >€10,000 million pa
Nuclear >€2,600 million pa
Renewable >€2,400 million pa

The report also gave tentative estimates of subsidies and other kinds of support as:

Fossil fuels >€70,000 million pa
Nuclear >€10,000 million pa
Renewable >€4,000 million pa

The European Environment Agency (EEA) has assessed direct and indirect energy subsidies by Member States and the EU Institutions for 2001 across the EU 15[19]. The EEA report estimated that total subsidies were €29.2 billion of which €23.9 billion was for fossil fuels and nuclear, and €5.3 billion for renewables

Christian Kjaer emphasised that the fossil fuel sector - coal, oil and gas - receives three quarter of all energy subsidies, primarily through the direct State Aid given to the coal sector and preferential tax rates for gas and oil exploration. The nuclear sector, according the EEA receives approximately 7%, but the paper notes that this does not include the State support for liability insurance. Furthermore, with no new reactor construction programmes being undertaken in 2001, less financial support will have been allocated than in other years.

Touching on the subject of externalities of energy generation, he mentioned that they are in effect largely environmental and social, as the hidden costs of production not accounted for in the pricing electricity production, causing damage to the environment, through emissions, waste production or damage by the construction and operation of facilities. These costs are external as they are paid by third parties or by future generations

According to Kjaer, the European Commission has restated its position that the external costs of energy should be included into the price of electricity and energy: *'Member States need to create a level playing field in the energy sector, by including external societal benefit/costs in their energy policy framework'*[20].

[19] European Environment Agency (EEA), *Energy Subsidies in the European Union: A brief overview*, 1/2004, ISBN 92-9167-689-6.
[20] Communication From The Commission To The Council And The European Parliament The share of renewable energy in the EU. Commission Report in accordance with Article 3 of Directive 2001/77/EC, evaluation of the effect of legislative instruments and other Community policies on the development of the contribution of renewable energy sources in the EU and proposals for concrete actions, SEC (2004) 547, COM (2004) 366, 26th May 2004

In 1991 the EU and United States launched ExternE[21], a joint project to assess the economic costs of different externalities from the production and use of energy.

In July 2001 the European Commission issued a press release on the findings of the study. The study concluded the "*cost of producing electricity from coal or oil would double and the cost of electricity production from gas would increase by 30% if external costs such as damage to the environment and to health were taken into account. It is estimated that these costs amount up to 1-2 % of the EU's Gross Domestic Product (GDP) (...) They have to be covered by society at large, since they are not included in the bills which electricity consumers pay"*[22].

Within the ExternE research to date a range of environmental costs have been allocated to different energy sources. The report has been criticised for failing to consider the full environmental impact of climate change or some impacts of nuclear power. For example the report states that the "reliable values of accident, high level wastes impacts, nuclear proliferation and impacts of terrorism have not been developed in ExternE. These omissions may well be significant and therefore should be clearly noted in any assessment[23]".

Analyses in Germany have suggested that the environmental costs of energy are greater than the more obvious direct support given to renewable energy[24]. It is estimated that the total saved external costs of renewable energy installed in Europe in the period 2000 to 2010 is up to more than € 320 billion[25].

The main goal of introducing EU legislation to liberalise electricity and gas markets was to increase competition in the different areas of the sector and to create a level playing field between generators. Although market liberalisation is expected to give all consumers the ability to choose their energy supplier by mid 2007 and while the number of consumers that are free to choose their supplier increases, there is considerable doubt as to whether the market opening will also lead to a real choice of supplier. Giving consumers the freedom to choose supplier does not necessarily guarantee effective competition.

Touching on the subject of freedom to choose supplier, Christian Kjaer said the following:

"The main goal of introducing EU legislation to liberalise electricity and gas markets is to increase competition in the different areas of the sector and to create a level playing field between generators. Although market liberalisation is expected to give all consumers the ability to choose their energy supplier by mid 2007 and while the number of consumers that are free to choose their supplier increases, there is considerable doubt as to whether the market opening will also lead to a real choice of supplier. Giving consumers the freedom to choose supplier does not necessarily guarantee effective competition".

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[21] http://externe.jrc.es/overview.html

[22] European Commission: 20th July 2001, *New Research Reveals The Real Costs Of Electricity In Europe*. http://europa.eu.int/comm/research/press/2001/pr2007en.html

[23] ExternE: 1998 update*; Aggregation of Externalities*, page 497, Volume 7.

[24] Wolfram Krewitt, Joachim Nitsch German Aerospace Center (DLR) Institute of Technical Thermodynamics, System Analysis and Technology Assessment Stuttgart, Germany, *Workshop on Long Term Energy Prospects and the Role of Renewable Energies* Brussels, European Parliament 18th March 2004, *Forecast Scenarios for the Potential Role of Renewable Energies*

[25] EREC: *Renewable Energy target for Europe: 20% by 2020.*

Which is the way ahead according to Christian Kjaer and EWEA?

Any realistic roadmap must take into consideration the many-facetted challenges that Europe faces due to the following factors: Economic growth, employment, technology development, exports, environment, sustainable development, Kyoto (-8% CO2), power demand up 1,6% pro annum and energy supply based on few indigenous resources (2002: EU Energy import: 50%, 2025: EU Energy import: 70%).

Summing up the documentation he had so far presented, Kjaer reiterated that real competition in the EU electricity markets was a myth: Four Commission benchmarking reports speak of endless distortions, the existence of national and regional monopolies and oligopolies, no real consumer choice, lack of inter-connectors which is a precondition for real competition, no unbundling of production and transmission of power, of 75% of electricity subsidies going to conventional power (EEA), of Euratom shielding nuclear (33% of total EU electricity production) from internal market rules, of complete absence of any meaningful internalisation of environmental costs and power companies acting on both demand and supply side in the wholesale market.

Finally, Christian Kjaer drew the following conclusions from his presentation:

"In two decades, Europe will be importing 70% of its energy (up from 50% today) unless we change direction, according to the European Commission. It is clear that electricity will continue to play a large and increasing role in Europe's energy future, with half of the projected increase in gas demand expected to come from electricity. The inherent volatility of oil and gas prices is inflicting a multi-billion Euro drain on the global economy. A strategy of reliance on imported energy sources at unpredictable and uncontrollable prices requires economic stability in the producer countries. The current situation in the Middle East, and oil trading between €60 and €70 per barrel, highlights how big a challenge this is. Creating a sound investment framework for renewables and redesigning Europe's grids to accommodate large amount of indigenous wind power would require far less political effort and capital and serve as an effective hedge against high and rising oil and gas prices and make Europe less dependent on energy imports from politically unstable parts of the world. This would all contribute to the sustainability and strengthening of EU's global competitiveness.

If real competition existed in European electricity markets, it would have a positive knock-on effect throughout the European economies. But effective competition in the European power markets is a myth: Competition is far from effective and unless the current distortions in the emerging Internal Electricity Market are overcome, there will be no effective Internal Renewable Electricity Market for Renewables to compete in.

While some stakeholders are demanding more competition between renewable energy producers, it should be recalled that effective competition in the more than 90% of the market that is based on conventional electricity is a far cry from reality. This briefing shows that effective competition in conventional power is currently a myth. Given the interactions between the conventional power markets and the emerging market for renewable electricity, it will be impossible to create effective and real competition in the market for renewable electricity until we have a fully functioning

conventional power market. Effective competition in the conventional power market is a precondition for creating an undistorted and well-functioning market for renewable electricity.

It is premature to call for competition in the renewables power segment at a time of non-competition in conventional power. Moreover, many renewable energy technologies, including wind power would already be competitive if they had gotten the same attention in terms of R&D funding, subsidies, building up of monopolistic structures while taking external costs into account. Applying the 'polluter pays' principle alone would go a long way to level the currently non-level playing field between polluting and clean energy".

Effectively, the only way of influencing European energy supply is to make serious efforts with renewable sources. Evidence of the practically unlimited potential of European RES is the EU Wind Industry's 83% global market share in 2004[26].

Dr. Bertrand Barré, The European Nuclear Society and The International Nuclear Societies Council

13. Dr. Bertrand Barré, President of the European Nuclear Society and of the International Nuclear Societies Council, gave a presentation on **"The Facts behind Today's Debate"**. Dr. Barré started by presenting the European Nuclear Society, which includes organisations in 24 countries across Europe. He stressed that it was a learned society, not a lobby organisation and that he would present his view as President of the European Nuclear Society, not as representative of the nuclear industry as such.

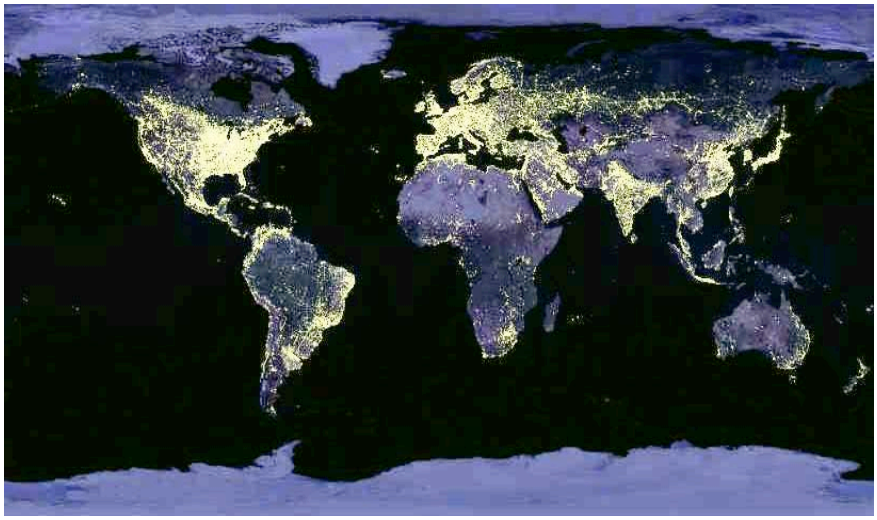


Figure 1: The Global Energy Picture is Changing, Undoctored NASA photo puzzle

[26] European Commission, *Green Paper on Security of Energy Supply*, 2001.

He proceeded by outlining the global patterns of electricity consumption, showing a NASA satellite photo of the planet (*see Table 1*). The East Coast of America, Western Europe and Japan were heavily illuminated, but Africa was still a dark continent. Also China, although the average consumption per capita is low, was illuminated because of its high population of 1.3 billion people. Even in India where the individual consumption is dramatically low, there was a lot of light.

According to Dr. Barré, given the demographics, our present picture of energy is changing drastically. What will happen in China, India, Brazil and in other places will be much more important than what will happen in Europe or even in the United States. That is why all projections of energy needs assume a growth, which is both in the north and in the development world, including forecasts that parts of the industrialised world will be making efforts for energy conservation.

Dr. Barré's second point was that there is now very little doubt left, that human activities and especially fossil fuel consumption have already modified the atmosphere and that this modification has altered the climate. Successive reports from the IPCC – *the Intergovernmental Panel on Climate Change* - show anthropogenic interference with the climate system. The IPCC predicted in 1990 that the size of the warming was broadly consistent with predictions of climate models, but it was also of the same magnitude as natural climate variability. Thus the observed increase could be largely due to this natural variability, i.e. the experts in the IPCC were not sure. In 1995 the balance of evidence suggested a discernible influence on global climate and the latest one in 2001 says that there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities. For Dr. Barré this was very important. Although there is still a residual controversy about the exact amount of these modifications, in effect the climate change is now beyond doubt.

In the order of the next fifty years we have to reduce our CO_2 emissions, while producing more energy, and the last part of the equation is that today 80% of the end energy is used for combustion of coal, oil and gas. 10% is traditional biomass, wood, dung, etc., nuclear and renewables all in all only 10%. So it is a huge challenge: Reduce emissions while producing more energy, when today 80% of all energy is combustion.

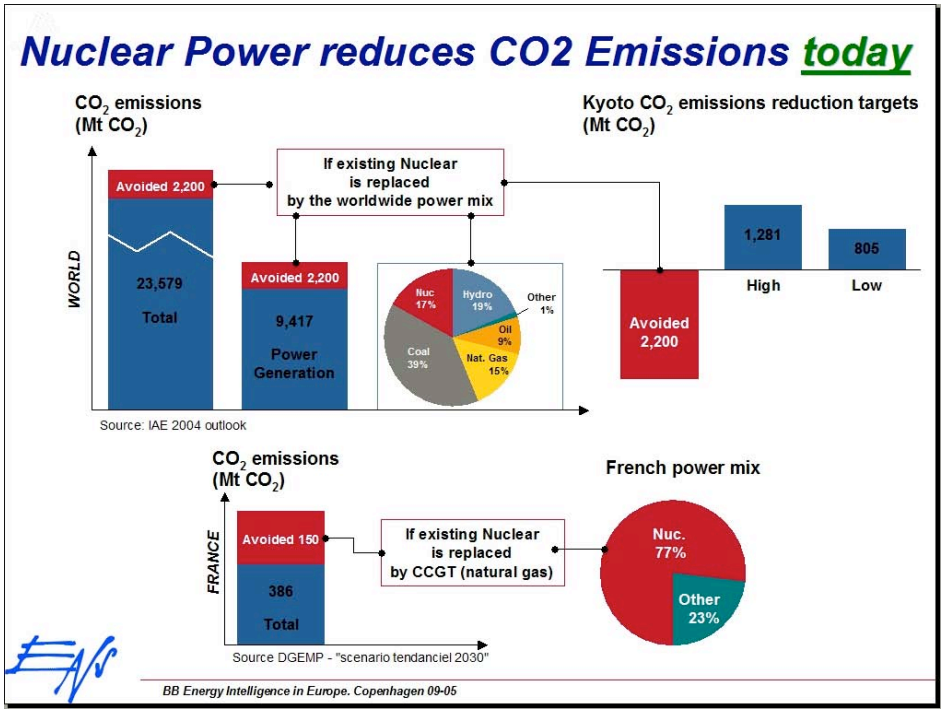
Commenting on possible answers to this challenge, Dr. Barré said the following:

"So obviously, there will not be a single magic bullet and here I would like to correct what has been said: We have not said that nuclear is the answer. At least I have never said that. And it is obvious that the first place where we have to do something is on the demand side. We will not be able to deal with such a challenge working only on the supply side. It is obvious. So it will have to start with conservation, energy efficiency, you can call it what you want, but you know what I mean. On the supply side we have to progressively reduce the share of combustion and we have to progressively increase the share of those energies, which do not emit significant carbon dioxide. That is why nuclear and renewables for me are part of the same package. It is also my deep conviction – this is still a bit controversial – that this is not enough and that we will have to implement carbon sequestration everywhere it will be reasonably practical, i.e. in all the central CO_2 producing stations: Coal power plants, refineries, cement factories, etc. I think if we are able to implement, in parallel, all those policies, maybe we stand a chance. So I will put nuclear and renewables in the same package".

Dr. Barré continued to elaborate on this point. According to him, renewables are most of the time – at least when they are used for electricity production - intermittent, so they cannot be stand-alone base-load production. This does not apply to heat production. Solar and geothermal for instance are best suited for heating, possibly together with heat pumps. But nuclear is another niche, and the competition for nuclear energy is not renewables. The nuclear industry is not competing with wind power, but with gas or coal although this might vary depending on the country in question.

Dr. Barré stressed that nuclear power reduces CO_2 emissions already today. According to IEA's 2004 Outlook[27], if nuclear power was replaced with the average mix of non-nuclear sources, and not only with coal, it would probably add to our present emissions 2,2 Bt of CO_2. This figure is already today bigger than the Kyoto target itself.

Figure 2: Nuclear Power reduces CO2 Emissions Today



Dr. Barré then said the following:

"Now, I could not resist driving something home. I think that it is quite paradoxical that we are here discussing some details under the Euratom Treaty, when we have these kinds of problems on our hands. Denmark is Niels Bohr country. He is one of the brightest minds of the 20th century and he was instrumental a lot in creating nuclear science. Denmark and all the Nordic countries are very environmentally conscious - that is the way we see you in the south. Denmark is a world leader in wind turbine technology. Yet, sorry, Denmark is one of Europe's worst CO_2 emitters per capita. And it is not improving. Your emissions in 1990 were 70 Mt CO_2. The target of the burden sharing

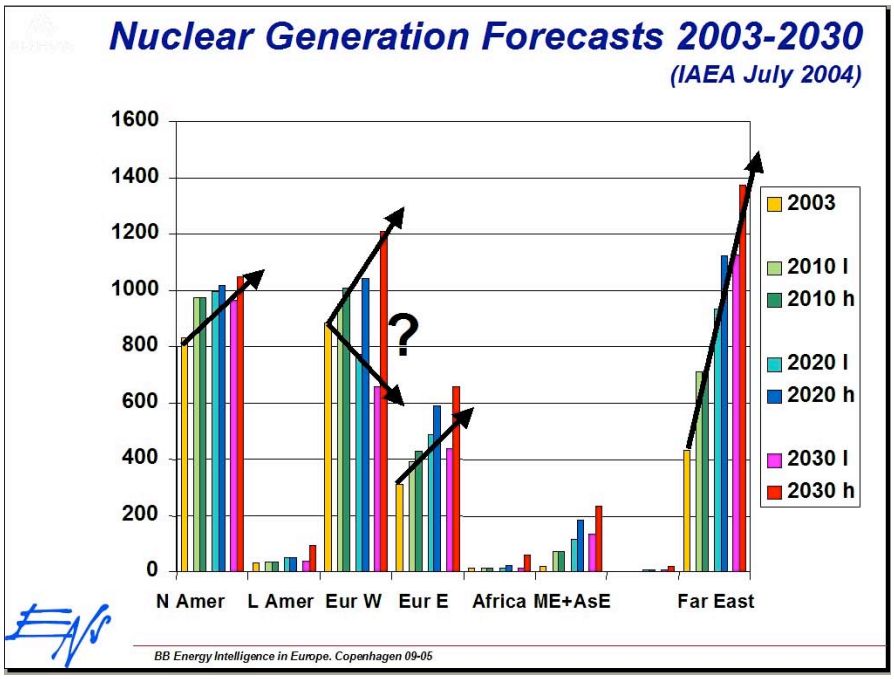
[27] The report in its entirety is not available on the Internet, but an executive summary of the *World Energy Outlook 2004* can be found at http://www.igu.org/database/2004/WEOEnglishExecSum.pdf

within the European bubble would call for a 21% reduction, leading you to 55 Mt. But according to a report from the European Commission from November 2003, under the present trend it will nut be minus 21%, it will be plus 16%. This is straight out of this report, which can be found at the Commission Website[28]*. So, isn't today's conference a bit surrealistic? I think it is".*

However, with respect to energy, the emissions are not the only issue for Europe. Nuclear power also contributes to the security of supply. But even with nuclear power, the energy dependence of the European Union will grow from 50% to 70% by 2030 and the conclusion of the European Commission is that if one is serious about the Kyoto commitment and concerned about the energy dependency, it is necessary to keep the nuclear option in Europe. Nuclear power has another advantage, which is stability of price. Uranium accounts roughly for 5% of the total KW/h costs from nuclear. If tomorrow the price of uranium was multiplied by two, it does not really matter. It would be 5% more for the nuclear KW/h. If tomorrow, as yesterday, the gas price was multiplied by two, it would be 63% more for the cost of a gas KW/h.

Dr. Barré then tried to answer the question: What is the projection of nuclear generation? Referring to predictions of the International Atomic Energy Agency's forecast from July 2004 (*see Figure 3*), he expected growth in North America and in Eastern Europe, including Russia, and drastic growth in the Far East Region. However, with respect to Western Europe it was difficult make predictions, considering that IAEA's low projection had decreased and its high projection had increased.

Figure 3: Nuclear Generation Forecasts 2003-2030



[28] The report – *REPORT FROM THE COMMISSION under Council Decision 93/389/EEC as amended by Decision 99/296/EC for a monitoring mechanism of Community greenhouse gas emissions*, COM(2003) 735 final, Brussels, 28.11.2003 - can be found at http://europa.eu.int/eur-lex/en/com/rpt/2003/com2003_0735en01.pdf

Commenting on the concept of a level playing field in the energy sector, he stated that in his opinion it was a silly concept. Given their present state of development, renewables must be subsidised and politically supported just as nuclear power used to be in the 50ies and the 60ies. A true level playing field would simply thwart and maybe kill renewables and co-generation. The margin for progress in costs for renewables is huge, but nuclear power is still the cheapest option. In France, with a level playing field in the electricity market, the wind turbines would stop, because the electricity it produces is sold at a fixed price much above the normal market price.

Concerning the Euratom loans: They are completely restricted to safety improvements in the accession states. There were not any Euratom loans for Kyoto and there will not be any Euratom loans for Flamanville[29]. Finally, Dr. Barré pointed out that the budget for European R&D for fission in the Framework Program 6 amounts to €190 million. The budget for renewables R&D in the Framework Program 6 amounts to €890 million, roughly five times more[30]. In his opinion it was OK, because they were not on the same level of maturity, but that only tends to show that the concept of a level playing field is stupid.

Debate: "Barriers to and Solutions for a level Playing Field in European Energy Policy"

14. The participants of the debate "**Barriers to and Solutions for a level Playing Field in European Energy Policy**" were **Dr. Bertrand Barré**, President of the European Nuclear Society, **Rebecca Harms**, MEP, The Greens/European Free Alliance, and **Mycle Schneider**, International Consultant on Energy and Nuclear Policy.

Debate chair was **Stephen Tarlton**, Editor of Nuclear Engineering International[31].

Stephen Tarlton started by commenting the term "level playing field", which he described as unhelpful at least with respect to the electricity generation industries, because it can mean anything to anyone. According to him, if we decide on an energy policy, there needs to be a mechanism to achieve that policy. For example, a government might decide on having a particular energy mix, a certain percentage of its generation coming from renewables, a certain percentage from coal, whatever it is going to be, that require a considerable number of conditions placed on the market to achieve those objectives. Hence, the terms "energy policy" and "level playing field" ought not to

[29] Editor's note: The French energy company *Electricité de France* (EDF) is expected to build its prototype European Pressurized Reactor (EPR) at the Flamanville site in the department of la Manche, which already houses two units of 1,300MW each. It will take five years to build Flamanville 3 that should be commissioned in 2012. Operation costs will amount to €3 billion. Source: The Basse-Normandie scientific & technologic newsletter, May 2005, and Nucleonics Week, 28 July 2005.

[30] For another interpretation of FP 6, please the Antony Froggatt's and Dr. Dörte Fouquet's presentations. Both define nuclear R&D as fission, fusion and funding for the Joint Research Centre, whereas Dr. Barré only includes fission R&D.

[31] A full transcript of the debate can be found at the Conference Website.

appear in the same sentence, because they are mutually exclusive terms. For this reason, he had asked the panellist to all define what they mean by the term "level playing field" before they discussed the barriers to and solutions for that level playing field.

The second point, Stephen Tarlton had difficulties with of the subject of the debate, was its scope. It was not really realistic to make much progress discussing such a huge topic in an hour. Because the focus of the meeting was the Euratom Treaty, he had asked the panellists to try to keep the focus on Euratom and its effect on achieving a level playing field, whatever that might be.

With respect to a summary of **Dr. Bertrand Barrés** *presentation, "***The Facts behind Today's Debate***", please see presentation no. 13. A transcript of the presentation in its entirety can be found on the Conference Website.*

Rebecca Harms started her response to Dr. Barré by mentioning that she had recently visited an offshore wind park near Copenhagen and that it was a wonderful project, especially for a capital of a European country. She was a little bit surprised that Dr. Barré had stated that the nuclear industry and the nuclear technology could help us win the battle against climate change. Recent developments in the nuclear industry apart from maybe Finland and perhaps China show that this is not realistic. There are a lot of words in the international debate on energy policies about the renaissance and future of nuclear power, but this does not correspond to reality. The reason that one or the other nuclear reactor is built is special financial and non-market conditions, which gives evidence to the fact that there is not a level playing field for nuclear power in Europe, only special treatment. In Europe there are no nuclear companies maybe beside one in France, which is prepared to build new nuclear reactors in a bigger number like in Finland or perhaps in Flamanville. The reason is bad economy.

Another big issue is that phasing out nuclear is a better way of fighting climate change, because it is possible to change the whole energy sector, if such a fundamental decision is taken. If one looks into the situation in Germany, it is possible to conclude that only after the government's decision to phase out nuclear power, there has been a new development on the energy production market. Only this decision made it possible to push for renewables and in the end also to push for the construction of new centralised power plants under favourable conditions.

Rebecca Harms then pointed to the issue of nuclear waste. In the European Parliament she is responsible for the debates on decommissioning funds and the votes on these have just started. According to the documents of the Commission, the situation of preparing decommissioning funds and being prepared for the challenges of the waste management and final disposal in most of the nuclear Member States are very bad. Most countries have not prepared their funds, even in Western Europe, and waste management is not prepared. Most of the countries have ideas on how to deal with this problem for an interim period, but with respect to the final disposal they are far away from acceptable and safe solutions. Rebecca Harms stressed that this will cost a lot of money. In France, even the Court of Auditors has stated that it is quite possible that the taxpayer will have to pay for the waste management in France – the country with the biggest nuclear production in Europe. In Great Britain there was recently a large payment from the government to the nuclear industry to start a fund, so the taxpayer has already paid for the start of this fund.

To her it seemed really strange that until today after decades of debate on this problem, the companies have not prepared these funds and that it is not even possible to be sure that the money is there for period of thirty, forty or fifty years beyond us, because then the real decommissioning after us will start.

Rebecca Harms then commented on the energy debate, perceived as a whole. For instance in Germany, the whole debate until today has not touched on the demand side. Most activities of anti-nuclear politicians or activists have ended in wind turbines, photovoltaic, biomass, solar power, etc., but not on the efficiency side of the issue. If we want to win the battle against climate change it is necessary to work on efficiency.

With regard to Euratom, she said the following:

"I am working on this Framework Program 7 on research in the European Parliament too and I fear that we will loose all these votes concerning the use of the research funds. On the European level there will be a decision to give the biggest part of these research funds to nuclear fusion. And this is a completely wrong decision. I would have loved if you had said something critical against it, because if you want to go with new energy strategies against climate change, you cannot seriously be in favour of fusion. The first fusion reactor will not be able to produce electricity before 60 years from today. That is what Max Planck Society in Germany tells us, so if we are not able to do anything relevant against climate change before that time, then we already decide with the FP 7 today that we will loose the battle against climate change. There are still some millions in the Program concerning fission and some of this I support. There must be research concerning nuclear waste, because I am convinced that the industry by its own will not produce acceptable and safe solutions for the waste".

Finally, she said this with respect to Euratom and the new Constitution:

"We had this conference on Euratom and I fear that we do not have the situation in Europe now to phase out the Euratom Treaty. I am not quite sure how the debate on the new Constitution in Europe will develop. I fear that the first approach for changing the Constitution failed. I must say this after visiting France several times and I must say this after several visits in the Netherlands. The first thing we have to work on at the European level is a good and acceptable Constitution and this Constitution must solve the problem we have with the lack of democracy in the European Union, especially among the European institutions, so I am very much in favour of giving the Parliament a better position in the European Union. How we can deal, if we want to solve this first, with this treaty and other treaties, I am not sure. The other problem is that we have no majority against the Euratom Treaty maybe for an interim period, so this period of the European Parliament is for sure not a period to phase out the Euratom Treaty. You can see this quite clearly if you look at the decision, the actual decision, concerning the Euratom research program".

Mycle Schneider started by commenting Dr. Barré's NASA satellite photo, showing the lighting of the world (*Figure 1 of his presentation*), arguing that some of this light serves only to be seen up there, because it is so dumb to enlighten. According to Mycle Schneider, some of those uses of electricity are just pure waste, e.g. to light up Belgian highways during the night, when there are three cars going by. Technologically speaking, it would be possible to save 70% or 80% of the energy that provides that light, which could be called energy intelligence: It is the same service

provided in a way, which reduces the consumption of energy in the first place. So the light doesn't say anything as such. The question is: How is it produced and what is it actually serving?

The second point he made was with regard to the competition between nuclear power and renewables. On this subject he made the following statement:

"Now, you (Dr. Barré) are from France. I have been living in France for 25 years. How would you explain then, that it took France pretty much twenty years to build as much wind power as in Germany in two months? If this can perfectly go along, I wonder why it didn't happen. It makes perfectly sense, because there is a lot of areas in France where it does make sense. And one can also ask: As of June 2004, according to the Energy and Environment Agency, there were over one thousand dossiers asking for grid connections of photovoltaic systems that were held back by the EDF[32]. If this all goes smoothly, one beside each other, I wonder why there is so massive hindering especially by the electricity utilities. But also by the entire lobby that has been put together over the years. EDF, I remember, has called co-generation a threat in a strategy paper, a threat. It was literally called "menace", threat. I mean, this is very clear. I don't actually see where there is harmonic coexistence".

Finally, on the question of a level playing field, Mycle Schneider said that it was not so important, what we called it, because everyone basically knew what was meant: It was to remove certain barriers that we know that exist for other energy forms or for other ways to cover energy service needs. Therefore, this question of coexistence was so fundamental. He believed that it was possible to show through history that centralised, large-scale power generation systems, whether they were coal, nuclear or gas, frequently lead to over-capacities in a large number of countries. And in a system of over-capacities, energy efficiency does not get any chance, because it cannot compete.

Antony Froggatt, Independent Energy and Environment Consultant

15. Antony Froggatt, Independent Energy and Environment Consultant from London, gave a presentation on **"Euratom's Economic Importance for Nuclear Power in Europe"**. Noting that The Euratom Treaty - one of the founding Treaties of the EU - has not been subject to any significant reform and has no end date, he pointed out that since its signing in 1957 the Treaty has remained a key pillar of support for the development of nuclear technology, both through its very existence and the associated institutional credibility that it gives and through specific support mechanisms. The over-riding intensions of the Euratom Treaty can be seen in its preamble, which states that "nuclear energy represents an essential resource for the development and invigoration of industry" and that Euratom is "resolved to create the conditions necessary for the development of a powerful nuclear industry".

The Euratom Treaty seeks to influence the following areas: *Promotion of research* (Chapter 1), *Dissemination of information* (Chapter 2), *Health and Safety* (Chapter 3), *Investment* (Chapter 4),

[32] EDF = the energy company *Electricité de France*.

Joint Undertakings (Chapter 5), *Supplies* (Chapter 6), *Safeguards* (Chapter 7), *Property Ownership* (Chapter 8), *The nuclear common market* (Chapter 9) and *External relations* (Chapter 10).

In his presentation Antony Froggatt primarily looked at the way in which the Euratom Treaty directly, or indirectly, affects the economics of the nuclear industry. This happens through (**1**) **direct financial support:** In April 2005, the European Commission published its draft proposal for the latest Framework Programme (FP). This allocates research and development funding across a whole range of sectors. The most striking aspect of the Commission proposal was the huge budget that the Commission was seeking. The total proposed budget for the 7th Framework Programme is €73 billion, compared to the €17.5 billion of the 6th FP. The increase is in part due to a larger EU (EU 25 rather than EU 15), in part due to a longer period, the 7th FP will last for 7 years, rather than the current 5 years. However, the budget also reflects a desire for greater EU research.

However, this overall budget still has to be approved by Member States and the European Parliament and given the current political uncertainties, the final budget may not be the same as originally proposed by the European Commission. This may cause particular problems for nuclear fusion as the significant budget increase – see below- is a result of an international commitment to co-fund a new research facility. The Commission proposal for the 7th FP is also remarkable as it once again highlights the 'special case` given to nuclear power, in that: Firstly, the research and development budget is separate from that of other energy programmes. This effectively means that nuclear is "ring fenced" from the other debates about how the limited funds for energy R&D should be allocated. Secondly, there is no Parliamentary co-decision of the Euratom programme, only consultation.

In Antony Froggatt's opinion this is clearly outdated and must be reformed. The most logical approached would be to phase out the Euratom FP and in future include all nuclear R&D into the energy budget. The separate research programme for nuclear power is not new. This can be seen the graph below which shows the Euratom and energy research budgets over the past four FPs.

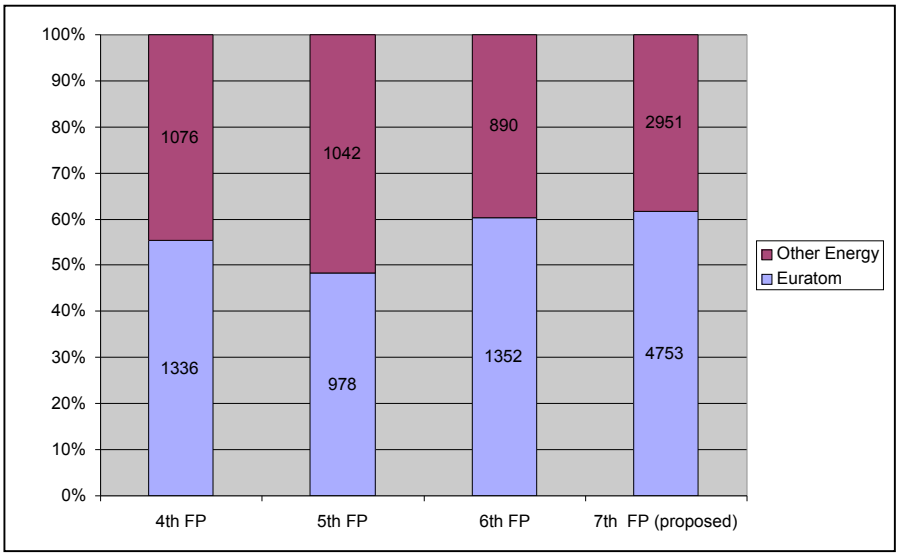


Figure 1: Comparison of Energy and Nuclear Research and Development Budgets

Source: Cordis[33] and European Commission[34] NOTE[35]

[33] http://www.cordis.lu/en/home.html
[34] *COM (2005)119 final*. For another interpretation of FP 6, please the Dr. Bertrand Barré's presentation.
[35] The Euratom Programme budget is officially for the years 2007-11, this is €3101million, however, the proposal also contains a provisional budget for 2007-13, of €4753 million.

As can be seen nuclear power, both fission and fusion is proposed to receive 60% of the total funds allocated to energy technologies. A more detailed breakdown of the Euratom research budget can be seen in the table below. The JRC and nuclear fission research programmes are expected to focus on radiation protection, nuclear waste management and the development of new reactor designs (including the Generation IV reactors).

Table 1: Breakdown of Euratom Framework Programmes

	4th	**5th**	**6th**	**7th**		
				2007-11 (proposed)	2011-13 (estimate)[36]	Total (estimate)
Joint Research Council (JRC)	441	49	319	541	241	782
Fission		142	209	395	211	607
Fusion	895	788	824	2167	1197	3364
Total	1336	978	1352	3103		4753

Source: Cordis[37] and European Commission[38]

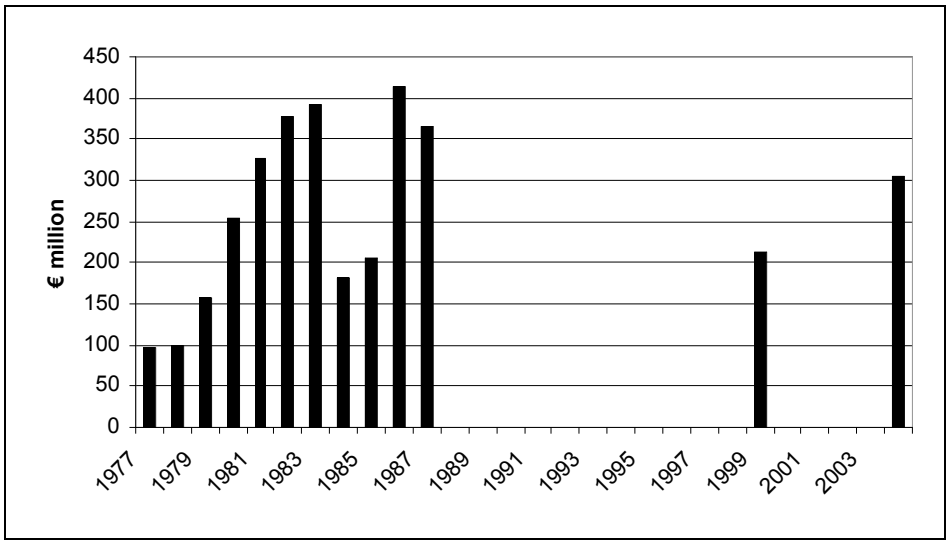
As can be seen fusion research is set to receive a considerable boost in its funding, an increase from roughly €200 million per year over the years 1995-2006 but rising to €600 million per year at the end of the 7th FP. This is in anticipation of the construction of the ITER (International Tokamak Experimental Reactor), which is to be located in France.

Euratom Loans Programme: Since 1977 around €3.2 billion worth of financial support for nuclear power has been awarded by the Euratom's nuclear loan facility. The loan facility enables nuclear companies to obtain financing for large projects, which given the uncertainty of nuclear construction, with its history of delays and cost overruns, they might not be able to obtain otherwise.

As can be seen, the use of the loan facility has decreased significantly over the last decade or so. However, three loans have been awarded in recent years, that for Kozloduy in Bulgaria in 1999 and for Khmelnitsky 2 and Rovno 4 in Ukraine and Cernavoda 2 in Romania in 2004.

[36] The additional year allocations have been calculated for fission and fusion using the same ratio as adopted in the previous period.
[37] http://www.cordis.lu/en/home.html
[38] *COM (2005)119 final.*

Figure 2: History of Euratom Loans 1977-Present Day



Source: European Commission, 2003[39].

In 2002 the European Commission put forward a proposal to raise the Loan ceiling by a further €2 billion. However, the Council of Ministers was unable to reach a decision on the issue and the legislation has not progressed.

Furthermore, it is interesting to look at the country breakdown of who receives Euratom loans. The graph below shows that France has received far more loans than any other country. In total France has received 39 separate Euratom loans totalling over € 1 billion.

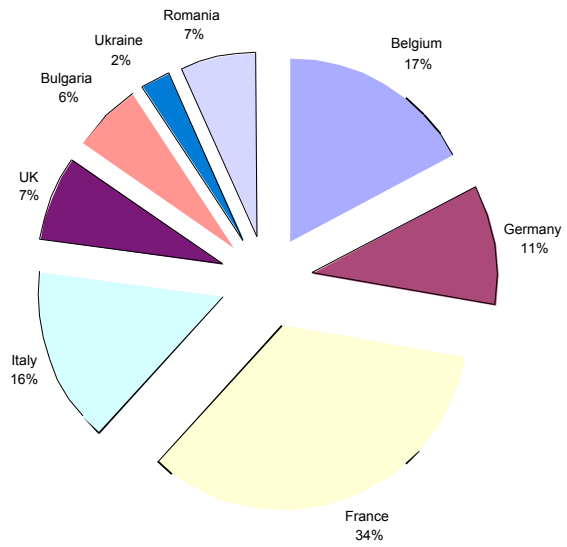


Figure 3: Recipients of Euratom Loans

Source: European Commission, 2003 and 2004.

[39] Information distributed by the European Commission to the EU's Finance Councillors Working Group February 2003.

There are a number of other projects, which might be put forward for further Euratom Loans. This includes the possible completion of Belene in Bulgaria, the further completion of the Cernavoda units in Romania and several reactors in Russia. Unless the European Council approves the further extension of the Euratom Loan fund, only €800 million is available for future projects.

Although the Euratom Loan budget is relatively small it is important for the completion of nuclear power. The financing of new nuclear reactors is complicated and risky, due to the large construction costs, long lead times and fluctuating market price for electricity. Consequently, the financial involvement of the EU is used to as a 'kite-mark' of approval to encourage other financiers and alleviate public concern.

Nuclear Programmes outside the European Union: Under the Euratom Treaty, the European Commission, with approval of only the Council and not the Parliament, negotiates bilateral 'Nuclear Co-operation Agreements' with a number of States. This has included China, Kazakhstan, Japan, Russia, Ukraine and Uzbekistan. These agreements are designed to encourage joint research efforts into nuclear waste and nuclear safety, encourage the exchange of nuclear material and non-proliferation measures. These agreements are also designed to support the mutual development of the nuclear sectors.

In 1991 the EU established initiatives under the PHARE and TACIS programmes[40] to try and improve nuclear safety in the region. By 2006 it is estimated that the EU will have allocated approximately €2 billion to address nuclear concerns in Accession countries and the former Soviet Union. Firms from Western Europe undertake most of this work[41]. Due to the large spending commitment on nuclear assistance programmes the PHARE programme only allocated a relatively small amount to other energy sources. Between 1990 and 1998 the total energy budget for the whole PHARE programme was 220 MECU[42].

However, of this approximately 180 MECU[43] was spent on nuclear safety programmes – around 80% of the total. Of the funds not allocated for nuclear, a European Parliament report estimates that only MECU 14.3 million was allocated to renewable energy[44], just 6.5% of the total. The Parliamentary report also notes that during the period 1990-1997 the average expenditure for electricity projects was €4.1 million per year. The estimated development of these nuclear aid programmes from 1991 to 2006 is shown in below.

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[40] The PHARE programme gives transitional aid to accession countries, while the TACIS programme applies to countries in the former Soviet Union.

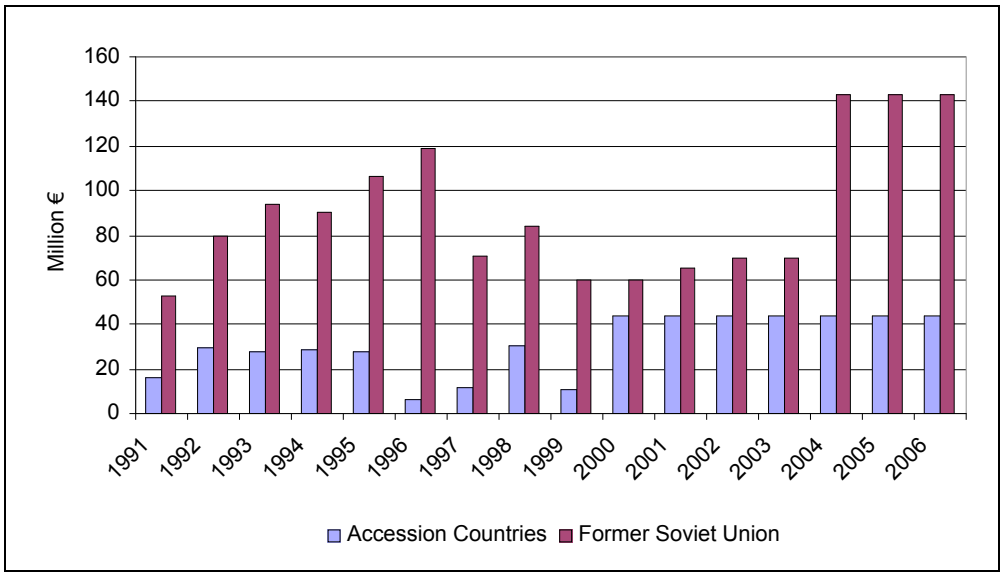
[41] European Commission 17th January 2002 *Nuclear Safety Strategy Paper, 2002-6* and Indicative Programme 2002-2003: Sorgem Organisation and Development, November 2000, *Assessment of Phare and Tacis Nuclear Safety Activities*.

[42] ERM, September 1999. *An Evaluation of Phare-financed Energy and Environment Programmes Inventory Report*, table 2, page 6. MECU stands for Million European Currency Units. 1 ECU is roughly equivalent to 1 Euro

[43] Sorgem Organisation and Development, November 2000. *Assessment of Phare and Tacis Nuclear Safety Activities*; Appendix A1, page 6

[44] Frans Oosterhuis, Institute for Environmental Studies, Vrije Universiteit, Amsterdam, draft report for the European Parliament's DG for Research, July 2001. *Energy Subsidies in the European Union*.

Figure 4: International Nuclear Assistance Programmes Funded by the EU



Source: European Commission -various[45].

(**2**) **Indirect financial support:** In the 1990s many Member States privatised their energy sectors. Simultaneously the European Commission introduced legislation to liberalisation the EU's energy markets. These processes are supposed to introduce a level playing field between different types of electricity generators. However, in 2001 the European Commission proposed a second wave of legislation to increase further competition between retailers and increase transparency. As the Commission noted one area that required special attention was to create a level playing field between different generators.

"*Experience in implementing this Directive shows the benefits that may result from the internal market in electricity, in terms of efficiency gains, price reductions, higher reductions, higher standards of service and increased competitiveness. However, important shortcomings and possibilities for improving the functioning of the market remain, notably in ensuring a level playing field in generation* (emphasis added)[46]".

Within Europe all of the current nuclear reactors were ordered when the markets were not liberalised. Consequently, less attention was placed on the economics of nuclear power and Governmental financial support than would occur today.

However, the Euratom Treaty, which is still valid today has as part of its remit to support the standard of living in the EU by "*creating the conditions necessary for the speedy establishment and growth of nuclear industries*[47]". Therefore, according to Antony Froggatt, there is a potential

[45] European Commission 17th January 2002 *Nuclear Safety Strategy Paper, 2002-6* and Indicative Programme 2002-2003: Sorgem Organisation and Development, November 2000, *Assessment of Phare and Tacis Nuclear Safety Activities*.
[46] Directive 2003/54/Ec Of The European Parliament And Of The Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC Recital 2, page 2.
[47] Euratom Treaty, Article 1.

conflict between the requirements of the electricity market directive and the Euratom Treaty. This conflict is becoming increasingly visible.

Approval of State Aid: The privately owned nuclear generator in the UK, British Energy, has been experiencing severe financial difficulties as a result of its poor performance in the UK's competitive electricity market. In September 2002, BE approached the UK Government claiming it needed aid in order to continue operating. The Government provided BE with a credit facility of £410 million[48], which was allowed by the European Commission on the condition that the UK produced a restructuring plan for the company. The restructuring plan incorporates a range of measures that would transfer many of British Energy's nuclear waste liabilities to the UK taxpayer – in other words, the restructuring plan constitutes state aid to British Energy. In September 2004 the Commission approved the plan, which could allow State aid for British Energy – worth around €5.1 billion in current values.

The Commission eventually released the justification for their approval of the State Aid case. This responds to a number of questions raised by objectors and lays out the reasoning for the approval.

"The Commission concludes that the measures foreseen by the UK authorities are appropriate to address the combination of objectives pursued and which are fully endorsed by the Euratom Treaty[49]".

Cases pending: Currently, the European Commission is also considering three other complaints or applications for State Aid regarding the nuclear sector.
British Nuclear Decommissioning Authority: In December the Commission launched an investigation into the establishment of the Nuclear Decommissioning Authority (NDA). The NDA will take over the assets of British Nuclear Fuels, most notably the Sellafield Mox Plant and reprocessing facility and the Magnox stations. This will firmly place the waste liability into state hands. At the launch of the inquiry the Commission has make it clear what is at issue. This in-depth enquiry will allow the Commission to judge, in particular, whether the contribution of the setting up of the NDA to the achievement of the Euratom Treaty's objectives outweighs the impact of the aid on the internal market[50].

Finish Nuclear State Aid: In early 2005 the European Renewable Energy Federation (EREF) made a formal compliant to the Commission over the financing for the construction of the reactor at Olkiluoto in Finland. EREF argues that the awarding of export credit guarantee from EU Member States (France and Sweden) totalling €710 million and the granting of a €1.95 billion loan through the public bank of Bayerische Landesbank and other financial institutions, with a very low interest rate of 2.6%, constitute State Aid.

Slovakian Nuclear Levy: The European Commission may launch an investigation into planned State Aid to the Slovak nuclear industry following a complaint in June 2005 by environmental groups led by Friends of the Earth Europe. The enquiry will centre on a 2004 Slovak government decision

[48] The credit facility was temporarily increased to £650 million. It currently stands at £200 million.
[49] Commission Decision of 22nd September 2004 on the State Aid which the United Kingdom is planning to implement for British Energy Plc, C(2004) 3474 Final.
[50] http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/04/1430&format=HTML&aged=0&language=EN&guiLanguage=en

effectively to increase the prices paid by all electricity users in the country. The scheme should have begun on 1 January 2005, but has been repeatedly delayed. If it eventually goes ahead, then the new levy would be used for a special nuclear decommissioning fund, which currently contains only around 10% of estimated total 'clean-up' costs[51].

Support by Non-Action - Failure to act on Nuclear Decommissioning Funds: During the operating life of a nuclear facility nuclear waste is accumulated which along with the dismantling of the nuclear facility must occur many years, or decades, after the facility has been closed. In order to pay for this activity, the operator of the nuclear facility should be required to put aside a percentage of the revenue. These funds must be accumulated and kept in such a way that it is guaranteed that when the final waste disposal and decommissioning of facilities does occur there are sufficient financial resources to pay for the necessary activity. It has long been recognised that the mechanism and amount of funds that utilities are required to put aside should be harmonised between Member States, both to ensure adequate funds are available and to avoid market distortions.

The size of these final funds are difficult to forecast, as this will depend on the interest rates of the accounts that the funds are placed in and on the technical aspects of the decommissioning and waste management activities. It is also difficult to anticipate what the final cost of the waste management will be, as the decommissioning of large-scale facilities has not taken place, nor has the construction of large high or intermediate level waste repositories. However, a rough prediction of the expected costs of waste management and decommissioning is given in the table below:

Table 2: Expected Nuclear Waste and Decommissioning Funds in the EU-15

Country	Expected Size of Fund (Billion Euro)	Companies
Belgium	17.5-22.5	Electrobel, EdF, SPE
Finland	1.6	IVO; TVO
France	63	EdF
Germany	25-30	EnBW, EON, DB, RWE, HEW
Netherlands	1.2	EPZ; NVGKN
Spain	9.66	HI, Nuclenor, CSE, UE, Fecsa, Enseds, Hidruna, Segre, Uefsa, ID, Iberdrola, Iberduero, Hifrensa, EIA
Sweden	4.8	Sydkraft; FKA; OKG; Vattenfall
UK	58	British Energy; BNFL

In order to require action in this area the European Parliament, in March 2002, in its first reading proposed to change the revised electricity market Directive to include specific requirements on decommissioning funds. This included a requirement that there must be separation of accounts for decommissioning activities and that these must be independently monitored. However, to many within the European Commission and Member States this proposal was not acceptable as it would for the first time place nuclear funding directly under the responsibility of the EC Treaty – and not Euratom.

[51] http://www.foeeurope.org/press/2005/MJ_13_June_Slovakia.htm

Therefore, considerable pressure was exerted on key parts of the European Parliament, so that during the second reading a compromise text was adopted. The European Commission's statement very clearly puts Euratom back in control of the issue[52].

In October 2004 the European Commission did publish a report on Decommissioning Funds. However, the document was incomplete, as it contained only partial information on EU 15 countries and no information on the new Members.

Antony Froggatt concluded his presentation by trying to answer the question "what future for the Euratom Treaty?", making the following statement:

"The Euratom Treaty is out of date and reflects a technological bias from the 1950s. It is widely accepted that the over-riding objectives of the Treaty do not confirm to today's energy market. Few can believe that a Euratom Treaty would be introduced today if it didn't exist. However, how to remove it is more complicated. Over the last decade there are have been a number of initiatives from Parliaments, Governments and Non-Government Organisations to try and have the Euratom Treaty scrapped or significantly reformed. However, these have not been successful for a number of reasons including:

Pro-Nuclear Government: Some countries, notably France, do not want to see the abolishment of the Euratom Treaty as they are highly supportive of nuclear power and both see the value of the Euratom Treaty and would resist a political initiative which could be seen as "anti-nuclear".

Unanimity Requirement: The reform of the EU Treaties requires the unanimous support of Member States, thus countries that would favour the abolishment of Euratom believe it would not be possible and therefore don't invest their political capital into action.

Diplomatic "headache": Often those negotiating the revision of the EU Treaties are from the Foreign Office or Diplomatic corps and they are not motivated to engage in the reform of a relatively obscure sectorial treaty, therefore Euratom reform is not given the priority it needs".

Despite this, there is an over-riding logic to remove the Euratom Treaty. This is accepted even by the nuclear industry that wish for the Treaty to be retained. The creation of a new Constitutional Treaty would have left Euratom as the only Treaty outside the new Constitutional Treaty, neither included and reformed nor abolished and abandoned. This is despite the efforts of a number of Government, the European Parliament, Members of the Convention and even senior figures in the European Commission.

Annexed to the final draft Constitutional Treaty was a list of declarations on the Protocols of the Treaty, including a declaration signed by Germany, Ireland, Hungary, Austria and Sweden which noted *"that the core provisions of the Treaty establishing the European Atomic Energy Community have not been substantially amended since its entry into force and need to be brought up to date.*

[52] EU Official Journal 2003 L176

(These countries) therefore support the idea of a Conference of the Representatives of the Governments of the Member States, which should be convened as soon as possible[53]*".*

This both indicate that there is some desire from Member States to change the Euratom Treaty, but also how far there is to go. What is remarkable is that some countries like Denmark that have been critical of Euratom and nuclear power have not signed up to this declaration.

However, the "period of reflection" following the no votes in France and the Netherlands on the Constitutional Treaty and the expected need for a revised proposal does give the opportunity for further and possibly meaningful discussions on the reform of the Euratom Treaty. This has already been publicly recognised the European Parliament, where a report has been prepared for discussions lead by the Constitutional Affairs Committee. The report is timetabled to be agreed by the Parliament by the end of 2005[54].

This public process offers an opportunity to once again push the Euratom Abolishment agenda and to begin encouraging Member States to once again take up the debate.

Dr. Dörte Fouquet

16. Dr. Dörte Fouquet, Attorney from the German Kuhbier law firm, gave the last presentation of the day: **"Nuclear Renaissance, TVO and the Support Issue"**[55]. On behalf of *The European Renewable Energies Federation (EREF)*, she has recently filed a complaint before the Commission concerning alleged competition distortion with respect to the financing of the fifth nuclear reactor in Finland.

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[53] *44. Declaration by the Federal Republic of Germany, Ireland, the Republic of Hungary, the Republic of Austria and the Kingdom of Sweden.* Germany, Ireland, Hungary, Austria and Sweden note that the core provisions of the Treaty establishing the European Atomic Energy Community have not been substantially amended since its entry into force and need to be brought up to date. They therefore support the idea of a Conference of the Representatives of the Governments of the Member States, which should be convened as soon as possible, *Official Journal of the European Communities*, C/310/465, 16th December 2004.

[54] http://www.europarl.eu.int/oeil/file.jsp?id=5261822

[55] On Friday August 12th 2005, the organisers of the conference sent a letter to Mr Pertti Simola, President and CEO of TVO, inviting him to participate as a panel debater in the afternoon debate on the subject "Barriers to and Solutions for a level Playing Field in European Energy Policy" or appoint a representative of TVO who could stand for TVO's positions on these issues. Not least due to the participation in the conference of Dr. Dörte Fouquet who had submitted a complaint to the Commission, alleging that the process leading up to the construction of the European Pressurized Reactor in Olkiluoto is in violation of EU's competition regulations and who gave a presentation on the topic "Case story Olkiluoto: A project favoured by Competition Distortion?, the organisers of the conference considered it essential that Mr Pertti Simola or another representative of TVO was given the opportunity to comment on the information and points of views that was presented by her at the conference and to participate in the debate.
On Sunday August 14th 2005, we received an e-mail from Anneli Nikula, Senior Vice President of TVO, CSR and Communication, which stated the following: "I have discussed with our managing director Pertti Simola for participating as panel debater at your conference on 23rd September. Unfortunately this time there are no possibilities that TVO can participate. I wish all the success for your conference".

Dr. Fouquet started her presentation by establishing that until 2004 there have been no successful nuclear plant orders in Europe and the US since the early seventies. In 2004 the Finnish utility *Teollisuuden Voima Oy* (TVO) ordered a European Pressurized Reactor (EPR) from the Framatome-Siemens-Areva consortium. However, major lobbying steps towards a renaissance for nuclear power are now being taken. The background is the Kyoto Protocol, the EU Security of Supply Green Paper, the Eastern European nuclear accession countries and rising oil prices.

Quoting *the Economist* - "More than half of the subsidies (in real terms) ever lavished on energy by OECD governments have gone to the nuclear industry[56]" - she listed several examples of preferential treatment of the nuclear power industry. *Using the US as an example*: Wind, solar and nuclear power got around $150 billion in cumulative US Federal subsidies over roughly fifty years, some 95% of which supported nuclear power. Nuclear power received far higher levels of support per kilowatt-hour generated early in its history than did wind or solar. Between 1947 and 1961 commercial, fission-related nuclear power development received subsidies worth $15.30 per kWh. This compares with subsidies worth $7.19/kWh for solar and 46¢/kWh for wind between 1975 and 1989. In their first 15 years, nuclear and wind technology produced comparable amount of energy (2,6 billion/nuclear and 1.9 billion kilowatt-hours/wind), but the subsidy to nuclear outweighed that to wind by a factor of over 40, at $39.4 billion to $900 million[57].

Who pays for back end costs for Nuclear power plants? *Example UK*: During deregulation of UK power markets and privatisation of nuclear power, the shareholders of British Energy (BE) were initially regarded by the British government as being responsible for these costs. After electricity prices fell and BE collapsed, the government burdened future taxpayers with many of the costs, as much as a century forward. If this had not been done, the book value of BE's equity would have been about (minus) -£3.5 billion. BE's liabilities would have been about minus £3.5 billion higher than their assets. BE's short- and long-term nuclear liabilities are £4199 million. Nuclear liabilities are here expressed in present value terms. Thus, if all the back-end costs were incurred ''today,'' they would total £ 4199 million for the UK alone[58]. Dr. Fouquet's general conclusion: *Nuclear industry can only survive under state protected and not really market-oriented conditions*.

She then proceeded by outlining another case study, namely Germany. Here, money for reserve funds for future dismantling amounts to estimated €30 billion in the hands of four energy companies where two of them hold the major part of it. This is much more than the gross domestic product of for example all three Baltic new EU members put together. It is also more than the two third of all countries on the planet have as gross domestic product. Since the liberalisation of the energy markets these funds enable German companies to go on a huge and extensive shopping spree, especially buying electricity and other companies in Germany and Central- and Eastern Europe but also in other EU countries such as Sweden. This reduces the number of serious competitors drastically and is in breech with the very idea of opening of markets. Completing her

[56] The Economist, *Nuclear power Out of Chernobyl's shadow*, May 6th 2004, from the print edition.
[57] Source: *FEDERAL ENERGY SUBSIDIES: NOT ALL TECHNOLOGIES ARE CREATED EQUAL* by Marshall Goldberg, REPP, July 2000 • No. 11
[58] See *Viewpoint, De-regulated electric power markets and operating nuclear power plants: the case of British energy*, James G. Hewlett Energy Information Administration, US Department of Energy, 1000 Independence Ave, SW, Washington, DC 20585, USA.

case study, Dr. Dörte Douquet poses the question: What if these companies go bankrupt? Who will pay for dismantling in the end (Enron was possible!)?

Touching on the subject of the EU Commission, she pointed out that the Commission continues to discriminate European research for Renewables. It has freely and unashamedly acknowledged that funding for renewables and energy efficiency has dropped from an average of €138 million per year in Research programme FP-5 (1999-2002) to €108 million per year so far in FP-6 (2003-2006). In comparison, the European Commission has proposed to increase the nuclear research budget under the Euratom R&D framework programme from €1352 million in the period 2002-2006[59] to €3103 million in the period 2007-2011.

After briefly mentioning an open subsidy case before the European Court in the First Instance (*Reserve funds for future dismantling of Nuclear plants in Germany as state aid*, Case EC T-92/02, Stadtwerke Schwäbisch Hall GmbH et alia/Kommission der Europäischen Gemeinschaften, sec. by: E.ON Kernkraft GmbH u.a.), in which a Court Decision is envisaged for 2nd half of 2005, she went on to describe the "TVO complaint" by EREF before the EU Commission dated from 14.12.2005. The major content of complaint is the following: (1) Syndicated loan-leading bank Bayerische Landesbank in 2003/2004 granting a loan to TVO of € 1.95 billion = more than 60 % of the fixed price contract at an interest of 2.6 %. (2) State export guarantees over €720 million from Sweden and France. (3) Violation by TVO of procurement rules for the energy sector and (4) predatory pricing.

Nor is the TVO EPR venture in Finland without state aid. The new plant project is welcomed by many, including the EU Commission, as a market oriented non-subsidy approach, but this is a fake: Big spenders were the Swedish Government (worth €100 million), the French Export Guarantee (COFACE) granting a non-notified amount of €610 million to AREVA, the second highest ever reported for COFACE. As mentioned above, a banking consortium under direct participation of the public Bayerische Landesbank gave in 2003 or in the beginning of 2004 a €1,95 billion syndicated credit for an interest of 2,6% to TVO. The apparent participation of Bayerische in the deal: 15 -20 %. Dr. Fouquet's conclusion: *The risk of violation of Public Procurement rules by TVO is high*.

Also: With respect to assessment of different support schemes, there are several types of advantages received by the suppliers, which have to be examined by the European Commission: Those granted by a syndicated loan under the leadership of BLB, those granted by the French Export Credit Agency COFACE and those granted by the Swedish Government (via SEK). None of those supports can be seen isolated though but underline the importance of co-ordinated performance. Analysing the apparent details of the loan: 2,6% interest will never allow a normal, adequate return of investment in a market where the average rate is much higher. This is an unprofitable transaction, which a normal commercial bank in the capacity as investor would not have made alone or without specific guarantees or pressure. Especially TVO has poor credit rating, which would obligatory lead to an increased interest rate needs, also in view of the Basle obligation. For comparison with this 2,6 % loan to TVO, a two-year loan for the German republic - and Germany is rated AAA+ - amounted to 2.57%. The selected MFI (Monetary Financial Institutions) interest rate on loans to non-financial corporation over €1 million with an initial rate fixation over five years has been, between August 2003 and September 2003, at 4.3%, according to the European Central Bank[60].

[59] For another interpretation of FP 6, please the Dr. Bertrand Barré's presentation.
[60] ECB Press release on January 15, 2004, www.ecb.int

Two major export guarantees help to strike the deal: The Swedish state apparently contributed to a large bank loan share within the syndicates loan from Nordea, in which bank the State is a large owner. SEK – a Swedish 100 % State owned Export Credit insurer - gave according to the government from its private business part SEK and "without any element of State aid"- agreed "on a credit of €100 million to TVO owned by the Finnish State and private companies. The credit is part of a package of offers for the finances of Finland's fifth nuclear reactor, a project of more than £3 billion of which about €2,5 billion will be financed by bank loans. This project opens up for possibilities for Swedish companies to become involved in the building business and for Swedish export companies through deliveries, which will secure jobs in Sweden[61]".

State aid to this project has also occurred in France: AREVA is a Public French Company and COFACE acted in this deal for the French Budget from Public funds: Guarantee has been granted in the 2nd trimester of 2004 for the contract signed between Areva and TVO in the amount of €610 million - such an amount is the second highest ever reported[62]. The " l"assurance-credit export" insures the exporters and banks against the risk of non-payment due to commercial or political reasons under such contracts, which are not insurable on the private market. It focuses on the contracts for equipment and infrastructure of developing countries[63]. This state guarantee for AREVA is the only one granted for any energy project located in the EU[64].

Normally the Commission plays tough on intra Community state guarantees – but here it is apparently not the case. Already in 1977 the Commission made it undoubtedly clear that export aid in intra-Community trade "cannot qualify for derogation whatever their intensity, form, grounds or purpose[65]. This has since been common ruling, as outlined especially in the 1997 Communication of the Commission to the Member States pursuant to Article 93 (1) of the EC Treaty applying Articles 92 and 93 of the Treaty to short-term export- credit insurance[66].

Also, the fixed price contract of €3 billion and the predatory pricing behaviour must be scrutinised by the Commission. Standard & Poor's states already the price of €3,2 billion, according to 2003 figures. Framatome's CEO, Ralf Guldner admitted, that the situation is troublesome for his company, given the rising prices of raw materials. The issue of a fixed price is causing problems within the industry itself. German utilities have told Eléctricité de France that its asking price for a share in an EPR to be built in France is too high. They calculated that the EDF's asking price represents cost per installed megawatt of about 25% higher than the price charged to TVO for building Olkiluoto 3[67]. Westinghouse turned down the TVO deal on the following grounds: "We have decided not to make offer for the reason that it is not possible to recover the initial costs of the project if we are only to build one reactor. Our position is that a series of strictly standardised plants is necessary if nuclear power is to be a competitive alternative to natural gas" (quote: Per Brunzell, managing director of Swedish Westinghouse in Västerås)[68].

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[61] See: Ministry for Foreign Affairs, Cabinet Minister Östros, *To the Swedish Parliament, Response to Question 004/05:668 from Ingegerd Saarinen regarding export credits for nuclear power.*

[62] The highest amount of €758 million was granted to Chantiers de l"Atlantique in the second trimestre of 2001. Otherwise, few of the guarantees exceed €200 million.

[63] http://www.cofaceCOFACE.fr/dmt/rubc_asscrexp/indexc.htm

[64] http://www.COFACE.fr/rub01_gr/gc.htm

[65] *7th Commission report on competition policy* (1977), point 242.

[66] *Official Journal C 281, 17/09/1997 P. 0004 – 0010.*

[67] Platts nuclear news Flashes, May 25, 2004.

[68] Translation of short article in the newsletter *Kraft-Affärer No 2/2003*, p. 4.

Dr. Fouquet went on to analyse some of the legal aspects with respect to the complaint: Regarding the alleged violation of Public Procurement Directive 92/38/EC by TVO, the company itself is not a "public undertaking". However, Article 2 paragraph 1 (b) of the above Directive states that it should apply to "c*ontracting authorities"* which when *they are not public authorities or public undertakings, have as one of their activities any of those referred to in paragraph 2 or any combination thereof and operate on the basis of special or exclusive rights granted by a competent authority of e Member State.*" Art.2 paragraph 3 states that a *contracting entity shall be considered to enjoy special or exclusive rights in particular where - in case of paragraph 2 (a)- the entity supplies with drinking water, electricity, gas or heat a network which is itself operated by an entity enjoying special or exclusive rights granted by a competent authority of the Member State concerned.* The Finnish Transmission system is such a network enjoying special or exclusive rights granted by the Finnish State, which holds 37% of shares and 50 % of votes in Fingrid Oy. One shareholder of Fingrid Oy is PVO, which holds 56.8 % of TVO and has 33.3 % voting rights in Fingrid Oy.

She also stated the following: (1) TVO was fully aware of the above predatory pricing scheme of Framatome/ANP and also of the COFACE and Swedish guarantee. (2) Knowing that it was done by public support, TVO was obliged to demand of the applicant in the tendering process to ask if state support schemes were notified to the European Commission. (3) The tendering agency should ask in cases of "abnormally low" offers and according to Art. 34 Directive 93/38/EEC coordinating the procurement procedures of entities operating in the water, energy, transport and telecommunications sector which provides: *"Contracting entities may reject tenders which are* ***abnormally low*** *owing to the receipt of* ***State aid*** *only if they have consulted the tenderer and if the tenderer has been unable to show that the aid in question has been notified to the Commission".*

Dr. Fouquet ended her presentation by concluding that there was very superficial or no evaluation at present by the EU Commission, also predicting that the DG COMP would probably decide that no state aid is involved in the TVO case. Apparently, the DG TREN had looked into the case and closed it without informing the complainant. No other DG had looked into the case.

Dr. Lutz Mez; The Environmental Policy Research Centre in Berlin

17. Dr. Lutz Mez from the Environmental Policy Research Centre in Berlin, who was also the chair for the morning programme, made the Conclusions and closing on behalf of **Dominique Voynet**, French Senate member and former Minister of the Environment. Dr. Mez noted that there had been consensus between the different parties represented at the conference on the necessity of promoting renewable energy sources and energy efficiency. If there were a controversy, it would be with respect to the following basic question: Should we go nuclear and use fossil gas as transition or are there other options? What is the technology strategy?

Stressing the necessity of establishing scenarios for future developments and perhaps even more the urgency of implementing new policies and measures, Dr. Mez called on utilities to work on stimulating innovation and change of behaviour in society.

In the final conclusion, Dr. Mez said the following:

"I think one very good thing to do as a conclusion from this conference would be, if the parliamentarians not only from Denmark but also in the other parliaments could start parliamentary initiatives to look at the question of the Euratom Treaty and also put this question before the governments and in the second stage raise the issue in an inter-governmental conference (...) This could be done. It could also be done in a feedback to or in cooperation with the European Parliament".

The organisers' conclusions and recommendations

I. The following conclusions can be drawn from the conference with respect to nuclear issues:

(A) Although there is currently talk of a renaissance of the nuclear industry globally and in Europe, this does not correspond to reality. The nuclear power plants are aging and there is no indication that it will be possible to replace the units that are being shut down. Over the next decade, when 80 units in the world turn age forty, it is impossible that all of these units will be replaced because it would be industrially not feasible. The only way to maintain current operating numbers is to extend the lifetime of the reactors.

(**B**) *Nuclear power is not a solution to the climate* problem. Although nuclear power emits less CO_2 than fossil fuels and even less than many renewables in some calculations, it is impossible to compare the same system with or without the use of nuclear power on the basis of emissions avoided. Also, there is no correlation between emission reductions trends in specific States and their respective share of nuclear power. World IIASA[69] scenarios, which cross hypotheses on renewables and nuclear share with hypotheses on energy demand, show a low additional value of nuclear power. It can also be argued that in terms of greenhouse gases abatement efficiency per euro spent there are a number of options, in particular energy conservation and co-generated biomass that are significantly more effective than nuclear power.

Whether the nuclear option is legitimate in the context of climate change also has to be evaluated in the perspective of the problems facing nuclear power today (accident and proliferation risks, waste management, potential terrorist targets, etc.). The nuclear option is not consistent with the gap between actual development of nuclear energy and levels of emission reduction that must be achieved. Nuclear power which generates 17% of world electricity today represents the range of 300 MteC avoided, which is equivalent to the results expected from Kyoto. It took 50 years for the nuclear industry to reach that point. Meanwhile, CO_2 emissions from fossil fuel consumption have risen about 15 times more (+ 4.700 MteC). Carbon emissions from this sector account for 15-20% of all anthropogenic GHG emissions. This sets the level "needed" for nuclear power to solve climate change alone to a rough 10-fold increase.

As the potential of alternatives increases, the effectiveness of nuclear substitution decreases. Other advocated tools in this respect are energy efficiency and renewables. The issue is to choose between these options in a policy that is a breaking policy in any case. In this context it should be remembered that the systemic impact of nuclear power has been an obstacle to the development of ambitious demand side policies and renewable programmes everywhere.

Although it is a valid objection that even countries like Denmark, which has a large share of renewables in their energy-mix, can belong to Europe's worst CO_2 emitters per capita, there is no correlation between trend in Member States and their share of nuclear power. France is the premier example of this: The country has 78% of its electricity from nuclear power but will not meet its objective of stabilising emissions. France is not matching its long-term objective of 4-fold reduction by 2050.

[69] IIASA = The International Institute for Applied Systems Analysis.

(**C**) *The Euratom Treaty has had and still has a significant importance for the development and maintenance of nuclear technology in Europe, both through its very existence, the associated institutional credibility that it gives and through specific support mechanisms.* The overall intensions of the Euratom Treaty can be seen in its preamble, which states that "nuclear energy represents an essential resource for the development and invigoration of industry" and that Euratom is "resolved to create the conditions necessary for the development of a powerful nuclear industry". The Euratom Treaty affects the economics of the nuclear industry through direct and indirect financial support in the following ways:

(1) Direct financial support: This kind of support includes *the Framework Programme (FP)*. The total proposed budget for the latest of these Programmes - the 7th FP - is €73 billion, compared to the €17.5 billion of the 6th FP. The Commission proposal for the 7th FP highlights the special case given to nuclear power, in that firstly, the research and development budget is separate from that of other energy programmes, which effectively means that nuclear is protected from the other debates about how the limited funds for energy R&D should be allocated and secondly that there is no Parliamentary co-decision on the Euratom programme, only consultation. Nuclear research - fission and fusion - is proposed to receive 60% of the total funds allocated to energy technologies in the EU. The Joint Research Centre and nuclear fission research programmes are expected to focus on radiation protection, nuclear waste management and the development of new reactor designs, including the Generation IV reactors. Fusion research is set to receive a considerable boost in its funding, an increase from roughly €200 million per year over the years 1995-2006 but rising to €600 million per year at the end of the 7th FP. This is in anticipation of the construction of the ITER (International Tokamak Experimental Reactor), which is to be located in France.

The direct financial support also includes *the Euratom Loans Programme:* Since 1977 around €3.2 billion worth of financial support for nuclear power has been awarded by the Euratom's nuclear loan facility. Although the Euratom Loan budget is relatively small it is important for the completion of nuclear power. The loan facility enables nuclear companies to obtain financing for large projects, which given the uncertainty of nuclear construction, with its history of delays and cost overruns, they might not be able to obtain otherwise. Consequently, the financial involvement of the EU is used to encourage other financiers and alleviate public concern. In 2002 the European Commission put forward a proposal to raise the Loan ceiling by a further €2 billion.

Finally, the direct financial support includes *Nuclear Programmes outside the European Union:* Under the Euratom Treaty, the European Commission, with approval of only the Council and not the Parliament, negotiates bilateral Nuclear Co-operation Agreements with a number of States. This has included China, Kazakhstan, Japan, Russia, Ukraine and Uzbekistan. Apart from encouraging joint research efforts into nuclear waste and nuclear safety, these programmes encourage the exchange of nuclear material and non-proliferation measures and are also designed to support the mutual development of the nuclear sectors.

(2) Indirect financial support: There is a potential conflict between the requirements of the electricity market directive and the Euratom Treaty. This conflict includes the Commission's approval of State Aid (example: The privately owned nuclear generator in the UK, British Energy, 2002 and 2004, state aid worth more than €5,5 billion). Currently, the Commission is also considering three other complaints or applications for State Aid regarding the nuclear sector. These

pertain to the British Nuclear Decommissioning Authority, Finnish Nuclear State Aid and Slovakian Nuclear Levy.

Not least the TVO EPR venture in Finland seems to be interesting in the context of indirect financial support. The new plant project is welcomed by many, including the EU Commission, as a market oriented non-subsidy approach, but the EPR might be supported by the Swedish Government - a support worth €100 million - and the French Export Guarantee (COFACE), granting a non-notified amount of €610 million to AREVA. Also, a banking consortium under direct participation of the public Bayerische Landesbank gave in 2003 or in the beginning of 2004 a €1.95 billion - more than 60 % of the fixed price contract - at an interest of 2.6 % - to TVO.

The indirect financial support also includes *Support by Non-Action*, not least *failure to act on Nuclear Decommissioning Funds used for market distortions*. Some experts consider the current administration of decommissioning funds in some Member States as the single most distorting factor in the European electricity market. Although the size of these final funds are difficult to forecast, as this will depend on the interest rates of the accounts that the funds are placed in and on the technical aspects of the decommissioning and waste management activities, it must be recognised that the mechanism and amount of funds that utilities are required to put aside should be harmonised between Member States, both to ensure adequate funds are available and to avoid market distortions. Such a harmonisation must guarantee that funds controlled by the nuclear operators are separated from their other financial resources.

(**D**) *The Euratom Treaty distorts competition in the European electricity markets*. Nuclear technology has its own Treaty - the Euratom Treaty - singling out one energy source and one industry sector, which therefore are treated differently from all other sectors in the Community. The direct and indirect support described above in (**C**) gives evidence to this fact. As mentioned, the Euratom Treaty places a privileged status for state funding on this sector. The European Court has never clarified the legal relationship between Euratom and EC state aid rules. Also, there is no democratic control through the European Parliament on matters relating to Euratom and loans for nuclear power can be granted without consulting the European Parliament. Hence, it is clear that Euratom makes competition in the internal electricity market very difficult by giving one third of the EU power supply, namely nuclear power, special privileges.

(**E**) *A European Constitution without the Euratom Treaty is a realistic option*. The realism of this approach is highlighted by the first preliminary draft for Euratom Reform submitted to the Convention in December 2002 - known as the Penelope Paper - prepared by a specific task force in the Commission headed by Francois Lamoureux, the then Director General of the European Commission Directorate-General for Energy and Transport. The Penelope Paper envisages the creation of an addition act on the Peaceful Use of Atomic Energy to replace the Euratom Treaty. In the paper the task force of the Commission proposes (1) to slim down the Euratom Treaty substantially by removing a series of provisions which duplicates those already included in the Constitution (and previously in the Treaty establishing the European Community), i.e. the chapters on the promotion of research and dissemination of information, on the institutions and on external relations, or were obsolete and/or had never been applied. This is the case in particular of part of the chapter on supplies, especially the provisions on the right of option on ores and the chapter on property ownership. The provisions retained in the Penelope Paper are (2) those on the setting of standards (Chapter III on health and safety) with small adjustments to incorporate nuclear safety,

Chapter IV on investments (with more explicit authorisation power), Chapter V on joint undertakings and Chapter VII on safeguards. Also (3), the European Parliament is restored to the institutional system, as it is given the power to adopt, with the Council, "Laws" for basic standards. Finally (4), the Penelope proposal inserts language on compatibility of investments with the single market as Article 11 states: "The Commission shall discuss with the persons or undertakings all aspects of investment projects, which relate to the objectives of the Union, including their impact on the proper functioning of the internal market. It shall evaluate, within this framework, the methods of financing the planned investments and shall decide on their authorisation of the investment project". This is significant, because it emphasises the deficiencies of the current Euratom Treaty and its compatibility with the European electricity market[70].

II. The following conclusions can be drawn from the conference with respect to renewables:

(**A**) *Renewables have the potential to provide the world population with energy.* With application of decentralised and centralised energy sources, the use of offshore wind farms down to 20 m. depth, limited use of onshore wind potential on farmland, solar rooftop systems and building integrated solar systems and residues from agriculture used as biomass, the world-wide energy need can be fulfilled in a demand scenario where high efficiency throughout the whole conversion chain is taken into account.

In this global scenario for the period 1994-2050, which assumes global solidarity and no major wars, the welfare that is the result of this will not decrease, because the scenario takes into account all the energy efficiency measures. The assumption is that by the mid 21st century, the average technology in use will equal the best current technology, with respect to energy efficiency. This is compounded with increasing population, increasing urbanisation, and increased per capita activity level by an average factor 2.7 for energy use. The GNP activity growth factor will be larger due to the de-coupling of economic and energy growth, and the distribution between regions will not be even, because a larger growth rate is assumed for the presently poor regions. Hence, in large countries like China and India, there will be a growth of about 4 times energy end-use per capita, but if the growth excludes energy used for food there will be almost 8 times more consumption compared to today.

Alternative energy sources are urgently needed, because fossil fuels are running out very quickly. Oil is a depletable resource and findings of oil in new fields have declined since about 1965. During the last 50 years, oil exploration has taken place in all corners of the world and the chance of large unexpected finds is very small. The expectations for the next decades are renewed growth in oil products used for transportation, due to the rapidly growing car ownership and air travel in countries with expanding economies, such as China. The growth in oil makes the expected reserves, exploited with use of enhanced recovering techniques, last to about 2040, and the geographical distribution of oil resources is such that OPEC production will have to rise by at least 60% during the period, while production in Europe and the US declines. The uncertainty in estimating the duration of reserves at different assumptions regarding price and improved extraction does not move the "trouble point" more than a few decades, but even this is important for the effort of developing alternatives to oil. Estimates from e.g. IEA, the Center for Strategic and International

[70] The draft proposal for the Civil Nuclear Act can be found at http://www.eu-energy.com/Pages%20from%20penelope_en.pdf

Studies in Washington and the oil industry itself recognise that there will be additional costs associated with raising oil production with 60%.

As already mentioned in **I.B** nuclear power is not an alternative to oil. Fission is not an option, because of lack or fuel resources. There is only enough uranium for the 2% nuclear penetration, which exists today. If nuclear generation is to replace the fossil fuel that is disappearing, it would necessitate 80% nuclear penetration and then the uranium resources would not be sufficient. In reality, the future of the nuclear option is depending on advanced fast breeder reactors, but they are yet to be developed. The breeder experiments, which have taken place, have all more or less failed and to produce a result, that is safe and does not produce proliferation is a major project, which will take at least 25 years or perhaps 50 years to complete. Fusion, which has now been underway for 40 years, will not be developed before the next 40-50 years.

Renewable energy, on the other hand, is a sufficient technology at a price, which is within a factor 2 of current energy prices. Wind energy is about 25% more expensive than present average electricity. In many places in the world, many bio fuels are 50% to 80% more expensive than current fuel costs. This also applies to solar heating, although it needs seasonal storage, as do solar cells. Cost-wise, solar cells are today more expensive by approximately a factor 5. Liquid bio fuels are not more than factor 2. Hydrogen is a possible intermediary fuel. Fuel cells need 10-15 years of development and substantial price reduction.

(**B**) *A sustainable energy transition for EU is possible*. Within the framework of a global vision for a change to sustainable energy until 2050, INFORSE-Europe[71] and its member-organisations have developed a vision for a transition to sustainable energy in Europe. The vision follows the EU target of 12% renewable energy in 2010, and shows how to realise the target of 25% renewable energy in 2020 as well as a transition to more than 95% renewable energy by 2050. It includes overviews of the development of the different forms of renewables.

The scenario expects *nuclear energy* to be phased out as the current nuclear reactors are stopped because of age, safety problems etc. This is expected to happen until 2020. It expects a gradual phase-out of coal-use, a slow but increasing phase-out of oil use till 2050 and growing gas consumption until 2010, followed by phase-out until 2050. Gas networks are expected to have decreasing importance. Energy trade is expected to be much less than today, and if the efficiency potentials are realised EU-15 might not be an energy importer after 2040.

With respect to the development *wind power*, the vision refers to the "Windforce10" report (updated in 2002 with the Windforce12 report), which has given an overview of how it is possible to realise a large development of wind power in EU-15, following the current trends. The expected development starts with realisation of the 70,000 MW target set by European Wind Energy Association and others. It continues with a target of 220,000 MW wind power for 2020 and a final development to 375,000 MW wind power by 2040, utilising 88% of the estimated potential (Vision2050 targets from Windforce10). According to Vision2050 it is not necessary to use all the full potential of wind power because of the large use of energy efficiency. For the 10 new EU countries a modest development to 15,000 MW of wind power is expected.

[71] International Network for Sustainable Energy – Europe is a network of more than 60 independent organisations working for a transition to sustainable energy, e.g. see www.inforse.org The network also publishes Sustainable Energy News, material for distance education on renewable energy, follows EU-policies, and education for sustainable energy.

Solar heating as well as *solar electricity* is expected to play large roles. Solar heating can cover 10% of the heating demand, and more if seasonal storages are introduced. In Vision2050, the use of solar electricity is expected to increase to about 5.5 m^2/capita in 2050 with an expected annual average output of 100 kWh/ m^2. This would give an expected electricity production of almost 200 TWh for EU. Most of the development will take place after 2020.

Biomass for energy is expected to grow to the limits set by environmental criteria and the use of a maximum of 14% of agricultural land for energy crops.

The vision is based on rapid growth of *energy efficiency* to reach an average level in 2050 similar to best available technologies today. Most energy consuming equipments will be changed several times until 2050, and if new generations of equipment are made with optimal energy performance, and markets are made to promote the most efficient technology, it will not be a problem to reach today's best available technologies, even though the efficiency gains required are very large, i.e. in the order of 4 times.

For *buildings* in EU-15, the target heat consumption is 60 kWh/m2 as 2050-average. This will require about a 57% reduction compared with current EU-average. If energy-efficiency measures are included in renovations, such a change is possible. This could be realised by raising building-codes to current low-energy housing levels by 2010, requirements that all major renovations include a major energy-renovation, and the embarking on a major program for passive-houses to achieve that the majority of new buildings are passive houses. For the new EU-countries is also expected a 57% increase in efficiency for space heating, but at a higher level of specific heat demand.

For *transport* it is assumed that the conversion-efficiency from fuel to transport-work is increased 2.5 times (from current 15-20% in combustion engine systems to 50% in fuel cell systems). The total efficiency increase is assumed to be in the order of 4 times compared with today's average. For rail and navigation are included increase in efficiency gains of 40% and 25% respectively.

The growth of *energy services*, i.e. heated floor-space, transported goods and people and energy consuming production, is expected to reach saturation levels during the 50-year period of the vision. For the EU-15, the growth 2000 – 2050 varies from +40% for use of household appliances to 35% in road transport. For the 10 “new” EU countries is expected higher growth than for EU-15, mainly for service and road transport. For both these sectors is expected a 2.5 times increase.

The energy conversion system should be developed to cater for the changes. The electric grid is likely to increase in importance, because electricity will also be used for transport, directly or via conversion to hydrogen, and some heating will be via the use of heating pumps. The large dependence on intermittent electricity supply makes it necessary to have flexible electricity consumption and energy storages in some form. It is expected that use of current storage in hydropower, pump-storage etc. combined with more flexible consumption for heat via heat pumps and for hydrogen can provide the necessary regulation at least until 2040. An obvious possible flexibility in power plants is to combine cogeneration plants with heating-pumps. When there is over-supply of electricity from solar and wind, the plant changes from producing electricity to consuming electricity, while still giving the heat users the necessary heat, and without loosing efficiency from turning to single production of heat or electricity. From 2040 there might be need in

addition for electricity storages, e.g. as chemical storages. For the "new" EU countries the use of wind power is expected to be less, and the need for electricity, leading to a lower fraction of intermittent supply, and less need for electricity storages.

The vision will lead to *decreasing primary energy demand* as the efficiency in end-use and in the energy conversion system is larger than the increase in demands for heated houses, electric appliances, etc. The vision includes an increasing reliance on electricity, and as an effect the electricity supply is not reduced considerably; but a large part of this is assumed to be used for transportation.

The *reduction of CO_2 from energy use* is expected to follow the 8% reduction target for 2010, followed by a 30-40% reduction in 2020, more than 50% reduction in 2030, and more than 95% in 2050. This will require efficient policies and measures for energy efficiency, renewable energy, and a sustainable transport system. Proven measures already exist for this, including internalisation of external costs with energy taxes, awareness raising, quality and efficiency labelling, minimum efficiency standards, feed-in tariffs for renewable electricity and gas, most energy-related R&D allocated for sustainable energy, land-use planning to minimise transport, etc.

The energy efficiency measures are expected to be *cost-effective*, either because they are already cost-effective or because they can become cost-effective if implemented on a large scale. The renewable energy technologies are expected to become cost-effective in general before their main implementation phase. Solid biomass is cost-effective today and it is therefore given priority 2000 - 2020. Wind power is cost-effective today in some sites, while it is expected to become cost-effective after 2010 in most relevant sites (main implementation 2010-2020). Energy crops and small-scale use of solar heating are both expected to become cost-effective after 2010 if the current trends continue (main implementation respectively 2010-2020 and 2010-2040). Solar for district heating and industry as well as PV is expected to become cost-effective after 2020 (main implementation after 2020).

The replacement of mainly imported energy with renewable energy and energy efficiency will give considerable employment benefits, in particular because most of the solutions are cost effective.

The realisation of the vision will require efficient policies and measures as mentioned above for energy efficiency, renewable energy, and a sustainable transport system. If these measures are used in a concerted way in the EU countries for the period until 2050, they can bring about the transition to sustainable energy.

*(***C***) Sufficient CO_2 reduction without nuclear power is possible in the Nordic countries*. According to *The Nordic Energy Systems Analysis Project* – a project developed by Greenpeace in cooperation with the Danish energy consultant Klaus Illum based on an extended version of Illum's SESAM model[72] - nuclear power in the Nordic area - Sweden and Finland – can be phased out in parallel

[72] The SESAM model of the Nordic energy system is a comprehensive, integrated physical model of: (1) *The end-use system*, i.e. buildings with inventories of electrical appliances, industries and production processes, means of transportation. (2) *The energy conversion and transmission system*, i.e. power and cogeneration stations of various types, boiler stations and individual boilers, units for the conversion of electric power to chemical, energy for use in vehicles, e.g. electrolyses units, and (3) *the system of energy sources*, i.e. hydropower, windmills, photovoltaic panels, biomass, fossil fuels etc. The model itself is a multi-scenario model, which facilitates the comparative analysis of a wide

with achieving the substantial reductions in CO_2 emission necessary to keep the global warming below 2 degree C compared to pre-industrial time. For industrial countries this means reductions in CO_2 and other greenhouse gases of at least 30% in 2020 and 80% in 2050.

The model clearly indicates that it is technically possible to phase out nuclear power in Sweden and Finland within 20-25 years[73] – and at the same time reduce Nordic CO_2 emissions from the energy and transport sector in accordance with both Kyoto-targets in 2008-2012 and the more substantial reductions needed in 2020 and 2030. In addition, in 2030 a nearly 60% reduction in Nordic oil use is possible – and 55% reduction in the use of diesel and gasoline in vehicles compared to now.

Even in the sustainable scenario[74], the assumed phase-in of wind in order to achieve this target is not extremely ambitious, amounting to about 200-400 MW per year in each of the 4 Nordic countries in the next 25 years – with the highest rate in the last 15 years of the period and in 2030 in total 29 GW installed, producing 85 TWh/year. That means e.g. for Denmark that wind in 2015 deliver 35% of the electricity consumption – the same as recommended by the Danish Wind Industry Association in its strategy plan "Vind eller forsvind"[75] - and for all 4 Nordic countries together that wind covers 15% in 2020 – a little more than projected for OECD Europe in Windforce12.

Currently, the amount of electricity used in the 4 Nordic countries for electric heating - at least 73 TWh/year – equals around 83% of all electricity produced by nuclear power in Scandinavia. Electric heating is especially widespread in Norway and Sweden – and is one of the main reasons why the electricity use per capita in households in Norway is 4.2 and in Sweden 2.5 times higher than in Denmark. Thus, a gradual conversion of electric heating – especially in Norway and Sweden – is necessary.

The change in transportation technology and means of transportation comprises lighter vehicles, more energy-efficient engines, electric public transport (trams, trolley buses, trains, etc.) and electric battery driven cars. It also comprises fuel cell driven buses and cars (electric power converted to chemical energy, e.g. hydrogen, for fuel cells), more public transport by modern, comfortable means and more goods transported by rail and ship.

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spectrum of alternative scenarios for the future development of the energy system in question. The system consists of a multitude of local systems (big and small), interconnected by a common electric grid.

[73] In the model, the 10 *Swedish reactors* currently in operation are closed down according to the plan already decided upon up by the Swedish government in October 2004. Pursuant to the Swedish Act on Nuclear Decommissioning from 1997, the owners and the licensee have a right to be compensated if a reactor is phased out by a government decision before 40 years of commercial operation. Hence, the government's special arbitrator's plan is designed to burden the state finances as little as possible: *2010-2015* Oskarshamn 1 is closed. *2016-2025* Oskarshamn 2, Ringhals 1, Ringhals 2 and Forsmark 1 are closed with three-year intervals. *2028-2040* Ringhals 3, Forsmark 2, Ringhals 4, Oskarshamn 3 and Forsmark 3 are closed. How quickly depends on the technological development. In *Finland*, the 5th reactor is put online in 2010, while at the same time two of the oldest are closed. Nuclear power in Finland will finally be phased out in 2030, because it will then no longer be needed in the electricity production.

[74] The project's S*cenario B:* (1) Extensive investments are made in the energy system infrastructure, renewable energy sources, improved weathering of buildings, etc. (2) Nuclear power is phased out and wind power is phased in. (3) The Kyoto/EU-obligations regarding CO_2-emission for 2010 and 2020 are met. (4) Substantial CO_2-reductions are achieved by 2030 and (5) oil consumption is substantially reduced.

[75] Vindmølleindustrien, *Vind eller forsvind i den globale økonomi, Vindkraften i fremtidens energisystem*, Maj 2004, http://www.windpower.org/media(277,1030)/vind_eller_forsvind.pdf

The financial costs of a sustainable scenario – investments, maintenance and depreciation costs and fuel costs - needed in the next 25 years (2005-2030) with moderate oil price growth ($60 to $90/barrel) are only a little less than the total costs needed in a non-sustainable scenario[76].

(**D**) *There is no level playing field for power, including renewables, in the EU.* Four Commission benchmarking reports as well as other official sources have revealed distortions, the existence of national and regional monopolies and oligopolies, absence of consumer choice and lack of inter-connectors which is a precondition for real competition. In addition to this, the reports speak of absence of unbundling of production and transmission of power, 75% of electricity subsidies going to conventional power, of Euratom shielding nuclear energy from internal market rules, of complete absence of any meaningful internalisation of environmental costs and power companies acting on both the demand and the supply side in the wholesale market.

While some stakeholders are demanding more competition between renewable energy producers, it should be recalled that effective competition in the more than 90% of the market that is based on conventional electricity is non-existent.

Hence, it is premature to call for competition in the renewables power segment at a time of non-competition in conventional power, including nuclear. Many renewable energy technologies, including wind power would already be competitive if they had gotten the same attention in terms of R&D funding, subsidies, building up of monopolistic structures while taking external costs into account. Applying the "polluter pays" principle alone would go a long way to level the currently non-level playing field between polluting and clean energy.

The conclusion must be that unless the current distortions in the emerging internal electricity market are overcome, there will be no effective internal renewable electricity market for renewables to compete in. Given the interactions between the conventional power markets and the emerging market for renewable electricity, it will be impossible to create effective and real competition in the market for renewable electricity until a fully functioning conventional power market is obtained. Effective competition in the conventional power market is a precondition for creating an undistorted and well-functioning market for renewable electricity.

III. Policy recommendations

The conference "Energy Intelligence for Europe" shows that energy policy, including nuclear policy, is an important integrated part of the dialogue on the European Constitution, also in non-nuclear countries. Therefore, it is crucial during the period of reflection that the Danish government as well as any other European government develops a political platform on European energy policies. Such a platform should include adopting a policy, which aims at obtaining a level playing field for renewables in the European Union. As a minimum, renewables should not be put in a less favourable position than other energy sources such as fossil fuels or nuclear power.

[76] The project's *Scenario A:* (1) No investments other than regular reinvestments in worn out equipment are made. (2) Nuclear power stations remain in operation. (3) Only electrical appliances are replaced by more energy efficient models along the way.

Any policy aiming realistically at obtaining a level playing field for renewables and other energy sources in Europe would imply the abolishment or the reform of the Euratom Treaty.

In order to achieve this goal, the Danish government and other governments in the European Union should:

(**1**) Join the initiative calling for an inter-governmental Euratom revision conference.

(**2**) Consider a unilateral withdrawal from the Euratom Treaty if it can be established that Euratom reform is not viable in the short or mid-term. The rationale behind this scheme is that the very existence of the Euratom Treaty comprising all Member States is a more divisive political factor than a Euratom Treaty, comprising only a few supportive Member states.

(**3**) Independently of the above-mentioned options explore all possible political mechanisms on the national and European level, including the European constitutional level, aiming at developing and maturing renewable energy technologies.

(**4**) Recognise that all these options should be considered urgent and given a high priority. This would imply that the government includes and at the same time gives high priority to these issues in the dialogue on the European Constitution. The dialogue should involve civil society, the political parties, the academic community, media, NGOs and stakeholders in the industry.

In order to facilitate the achievement of the afore-mentioned goal, national and European parliamentarians from all political parties should cooperate, calling on their governments to act on these recommendations.

Annex

1) **Some Ideas on the Possibility of Unilateral Withdrawal from the EURATOM Treaty prepared for the conference**
   By *Prof. Dr. Michael Geistlinger, University of Salzburg*

2) **A short Introduction to the Concept of a Treaty on Renewables and Energy Efficiency**

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Some Ideas on the Possibility of Unilateral Withdrawal from the EURATOM Treaty

By *Prof. Dr. Michael Geistlinger, University of Salzburg*

prepared for the conference

Energy intelligence for Europe
The Euratom Treaty and future energy options: Conditions for a level playing field in the energy sector.
Copenhagen, 23 September 2005

1. Problem

In the course of the negotiations on the accession of Austria, Sweden and Finland as well as of the former Eastern European states Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary and Slovenia, Bulgaria and Rumania the law of the European communities and European Union was dealt with as if it were forming a monolithic block. In fact, however, the European order and law are composed of a couple of independent treaties under public international law. Even if the EURATOM Treaty has been amended by title IV of the Treaty on the European Union of 7 February 1992 (Treaty of Maastricht), both treaties stand separately from each other. As art 1 para 2 of the Treaty on the European Union rules, the European communities, including the EURATOM, are the fundaments of the European Union, but remain individual international organisations under public international law. Also the Treaty of Amsterdam of 2 October 1997 did not touch at these basics. The treaties of the European communities have been simplified and made better readable. The fundaments, however, have not been changed. Also the Treaty of Nice of 14 February 2000 brought quite many substantial amendments with regard to the basic communities, but did not absorb them in one whole. Still, and this is the current state of law, the European Communities exist independently from and side by side with the European Union. They are dealt with as a package on the political ground, but are separate entities on the legal ground. Thus, the question whether a unilateral withdrawal from one of the European communities is legally possible for a state wishing to stay within the EC and the EU at the same time seems to be legitimate.

2. Provisions on its termination in the EURATOM Treaty

Art 208 EURATOM Treaty rules that this treaty has been concluded for an indefinite period of time. The treaty contains a provision on suspension concerning the voting and other rights of a member state (art 204), but does not rule on its termination, be it by unilateral withdrawal, by applying the so-called *clausula rebus sic stantibus* or by any other ground. Thus, the rules of general public international law with regard to the termination of an international treaty apply.

3. On the applicability of the Vienna Convention on the Law of Treaties 1969

Due to the non-retroactivity of the Vienna Convention on the Law of Treaties 1969 according to its art 4, the EURATOM Treaty which has been signed on 25 March 1957, does not fall under the immediate application of the Vienna Convention. Most of the provisions of the Vienna Convention are considered, however, as part of international customary law and have been in effect as such also in 1957 when the EURATOM Treaty has been adopted. Still the Vienna Convention is not binding on all members of the European Union. Nevertheless, due to the legal nature of these codified rules as part of international customary law all members of the EU and of the EURATOM Treaty, also those, being non-members of the Vienna Convention on the Law of Treaties are bound indirectly by its provisions as far as they reflect general international customary law.[77]

The rule of art 56 Vienna Convention 1969 on the withdrawal from a treaty containing no provision regarding termination, denunciation of withdrawal is considered to be such rule of international customary law.

Art. 56 reads as follows:

"1. A treaty which contains no provision regarding its termination and which does not provide for denunciation or withdrawal is not subject to denunciation or withdrawal unless:

a) it is established that the parties intended to admit the possibility of denunciation or withdrawal; or
b) a right of denunciation or withdrawal may be implied by the nature of the treaty.

2. A party shall give not less than twelve months' notice of its intention to denounce or withdraw from a treaty under paragraph 1."

It needs for further historical analysis around the years 1956 and 1957 in order to clarify what the parties intended to admit when they concluded the EUATOM Treaty. This can be left open in this small expertise, because it can be rather easily shown that the EURATOM Treaty is a treaty falling under the right to be terminated under art 56 para 1 lit b.

According to the commentaries of the International Law Commission there are certain treaties which by their very nature exclude the possibility of a unilateral withdrawal in case a treaty does

[77] See eg P. Reuter, Introduction to the Law of Treaties. London, New York, 1989, 22 (n° 62).

not contain a provision concerning its termination. Such treaties are peace treaties or treaties establishing a long lasting territorial regime,[78] but also treaties which by their nature are limited in duration. Commenting on art 17 of the draft Vienna Convention on the Law of Treaties, the ILC held in particular:

"(b) In the case of a treaty which is the constituent instrument of an international organization, unless the usage of the organization otherwise prescribes, a party shall have the right to withdraw from the treaty and from the organization by giving such notice as the competent organ of the organization, in accordance with its applicable voting procedure, shall decide to be appropriate".[79]

In the course of the later debate in the ILC on this provision which finally ended in the provision of art 56 as cited above, the ILC moved towards an easier and uniform procedure on all cases of application of a right to unilateral withdrawal from a treaty. Paragraph 2 of this provision is asking for a notification at least twelve months prior to the intended determination. It may be doubted whether the time frame of "at least twelve months" has become part of international customary law and has this been already in 1957.[80] What can be taken for granted, however, is that a notification in writing a reasonable period in advance of the intended termination has been required in 1957 and is required by international customary law also today.

4. International customary law on the termination of treaties applicable on the EURATOM Treaty

It follows from the reasoning above that according to international customary law underlying art 56 Vienna Convention on the Law of Treaties, there is a right to unilateral withdrawal from the EURATOM Treaty. Still the EURATOM Treaty is nothing more than a treaty setting up an international organization. This organisation falls within the roof of the European Union, but, thus, did not lose or change its character. An eventual entry into force of the Treaty establishing a Constitution of Europe[81] will not have an impact on the legal situation with regard to the possible unilateral withdrawal from the EURATOM Treaty, since the EURATOM Treaty will not be covered by the development of the European law initiated by this draft Constitution.

Michael Geistlinger

Salzburg, 19 March 2006

[78] See eg S. Bastid, Les traits dans la vie internationale. Paris 1985, 202.
[79] Yearbook of the International Law Commission 1963, II, 64.
[80] Bastid (fn 2) holds, that the ILC followed the current practice of states asking for such period of time.
[81] Official Journal of the European Union C 310, vol 47 (16 December 2004)

A short Introduction to the Concept of a Treaty on Renewables and Energy Efficiency (EURENEW)

I. The concept of a European Treaty on Renewable Energy and Energy Efficiency (EURENEW) was not examined at the conference "Energy Intelligence for Europe". However, considering that the main objective of the conference was to discuss policies aiming at obtaining a level playing field for renewables and other energy sources in Europe, it is reasonable to present the idea of establishing a counterpart to the Euratom Treaty in the shape of another European treaty: European Treaty on Renewable Energy and Energy Efficiency (EURENEW).

The concept of EURENEW can be regarded as a policy objective in itself or as a mere strategic and tactical mean to question the fact that nuclear power has its own treaty, but not renewable energy and energy efficiency, in order to accelerate the process of abolishing or reforming the Euratom Treaty.

II. In case that the European Constitution is adopted throughout Europe and the Euratom Treaty is abolished it could be argued that a separate treaty like EURENEW exhibits little conformity with a single Constitution. It also seems illogical to plead for a level playing field in the European electricity markets while at the same time opting for a special treaty to promote renewables and energy efficiency.

A critical stance has been taken by Ecologic - Institute for International and European Environmental Policy: "A further option is either to transform Euratom into a "Eurenew" or Climate-Treaty with the objective of advancing renewable energy technologies, or to complement Euratom with such a treaty. […] However, it is dubious whether this option would find adequate political support, and whether the officials responsible for implementation would develop a sense of ownership for such a treaty. A further setback is that such an option would give Euratom – or its successor – renewed legitimacy, thereby cementing its existence."[82]

III. The concept of EURENEW has been promoted by The European Association for Renewable Energy (EUROSOLAR)[83] and the European Forum for Renewable Energy Sources (EUFORES) [84], whose effective members include among others the European Wind Energy Association (EWEA)[85] and Vestas Wind Systems[86]. It has also gained the support of the German trade union IG Metall[87] and some employers' organisations, industry associations and green NGOs[88].

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[82] http://www.ecologic.de/download/briefe/2003/1820_brief_energy_en.pdf
[83] http://www.eurosolar.org/new/willkommen.php
[84] http://www.eufores.org/index.php?id=30
[85] http://www.ewea.org/
[86] http://www.vestas.com/uk/Home/index.asp
[87] http://www.igmetall.de/cps/rde/xchg/internet
[88] Cf. *Gemeinsame Erklärung - IG Metall, BUND und NABU für den ökologischen Umbau der Industriegesellschaft*, p. 8: http://www.labourcom.uni-bremen.de/ak-alternative_fertigung/rundbrf/rundbrf/rund031/referenzierte-Artikel/igm-mobilitaet.pdf and *Aktionsbündnis Erneuerbare Energien, vertreten durch IG Metall Vorstandsmitglied Wolfgang Rhode, überreicht Positionen zur Weltkonferenz Renewables 2004*, http://www.oekoline.net/457.0.html

In 1997 the European Parliament's Committee on Research, Technological Development and Energy issued a Report on the Green Paper from the Commission on renewables.[89] This report includes a recommendation of "a new treaty to promote renewable sources of energy" (EURENEW) in order to create "the conditions necessary for the speedy establishment and growth of renewable energy industries."

The European Parliament itself recommended EURENEW in a resolution from 1998[90].

Overall, EURENEW can be seen as part of a political trend aiming at the global institutionalisation of political mechanisms promoting renewables and energy efficiency. A related part of this trend was the German government's recommendation of an International Renewable Energy Agency (IRENA)[91] at the conference World Renewable Energy Assembly in Bonn in November 2005. The conference's final communiqué also called for a Renewable Energy Proliferation Protocol to be added to the Nuclear Non-Proliferation Treaty, a renewable energy priority for financing renewables in development aid and development banks, global industrial norms and standards for renewables and an international university for renewable energy under the auspices of UNESCO[92].

EUFORES, which confirmed its commitment to EURENEW in the so-called Edinburgh Declaration from October 2005[93], promotes the concept as part of coordinated European renewable energy and energy efficiency strategy (REEES) with the aim of a 100% energy supply from renewable energy sources in a few decades[94].

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[89] REPORT on the communication from the Commission on Energy for the Future: Renewable Sources of Energy - Green Paper for a Community Strategy (COM(96)0576 - C4-0623/96), Committee on Research, Technological Development and Energy, Rapporteur: Mrs Mechtild Rothe, http://www.europarl.eu.int/omk/sipade3?PROG=REPORT&L=EN&PUBREF=-//EP//NONSGML+REPORT+A4-1997-0168+0+DOC+PDF+V0//EN&LEVEL=0&NAV=S

[90] The recommendation has the following wording: "(The European Parliament) calls on the Commission to present a proposal for a Directive to ensure the access of renewable energies to the general energy-providing networks in real competitive conditions, and to consider seriously the development of a treaty on renewable energy so as to provide a real legal basis (a "Eurenew" treaty for renewable energy along the lines of the Euratom Treaty for nuclear energy)", The European Parliament, *Resolution on environmental policy and climate change following the Kyoto summit*, item 12, http://www.europarl.eu.int/pv2/pv2?LISTING=AfficheTout&PRG=CALDOC&FILE=980219&LANGUE=EN&TPV=DEF

[91] The speech of the German Minister of the Environment, Sigmar Gabriel, can be found at http://www.wrea2005.org/download/Speech_Gabriel_Wechsel_EE.pdf

[92] *Final Communiqué "The Human Right to Renewable Energy"*, World Renewable Energy Assembly (WREA) 2005 November, 26th to 30th, 2005, Bonn, http://www.wrea2005.org/final_communique.php

[93] European Forum for Renewable Energy Sources, *Declaration of Edinburgh 2005*, 6th Inter-Parliamentary Meeting for Renewable Energy and Energy Efficiency, http://www.eufores.org/fileadmin/eufores/documents/EUFORES_-_Declaration_Inter-Parliamentary_Meeting_-_Edinburgh_6-8_oct_2005.pdf

[94] Ibid. p.1 ff.