Parliamentary Assembly
Assemblée parlementaire
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COUNCIL OF EUROPE
CONSEIL DE L'EUROPE

Doc. 13366
10 December 2013

Energy diversification as a fundamental contribution to sustainable development

Report[1]
Committee on Social Affairs, Health and Sustainable Development
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Summary

Clean, secure and affordable energy is key to sustainable development and the quality of life. Europe is in transition to a more balanced development model that better respects our planet's capacity. All stakeholders – public authorities, businesses and consumers – must contribute to optimising energy production, delivery and use to achieve this goal.

Energy consumption must be decoupled from economic and demographic growth. Energy needs must be reduced through energy efficiency. The cleanest and most abundant energy sources – notably the renewables – must be used more.

Strong measures must also be taken to protect public health and the environment in any exploration or exploitation of shale gas and oil. Research needs to be stepped up to develop cleaner alternatives to hydraulic fracturing. Moreover, stricter safety risk policies and long-term solutions for nuclear waste management are necessary. Finally, the report proposes action to eradicate energy poverty, to improve taxation, market regulation and network co-ordination, and to promote best practice in the field of energy technologies.

1. Reference to committee: Doc. 12495, Doc. 12552, Doc. 12514 and Doc. 12600, Reference 3747 of 11 March 2011.

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A. Draft resolution[2]

1. Clean, secure and affordable energy is central to sustainable development and the quality of life. It is part of a society's broader ambition to embrace a more balanced development model that better respects our planet's capacity and resources. In the light of their commitments under the Rio+20 Summit on Sustainable Development and the Kyoto Protocol to the United Nations Framework Convention on Climate Change, European countries face a wealth of opportunities, but also challenges, in the transition to a more sustainable energy future.

2. To preserve and enhance national prosperity in a global context, public authorities, businesses and consumers in Europe must unite their efforts towards optimising energy production, delivery and use. Although a single European vision for a clean energy future remains elusive, the Parliamentary Assembly notes a growing political consensus on the need to cut energy-related greenhouse gas emissions, pollution and various risks, while enhancing competitiveness and making better use of existing resources.

3. The Assembly therefore strongly supports the European Union goals for climate and energy that aim, by 2020, to cut greenhouse gas emissions by 20% below the 1990 level, to cover 20% of energy needs from renewable sources and to shrink energy consumption by 20%. It believes that the non-European Union States should adopt similar or more ambitious targets when shaping their national energy choices.

4. Moreover, the Assembly is convinced that European society must decouple its energy consumption from economic and demographic growth and should moderate its energy needs by investing in energy efficiency and savings. This is particularly acute for heating, cooling and transportation in both industry and households, where the diversification of energy sources, technologies and consumption patterns can lead to huge efficiency gains and can create jobs.

5. The Assembly welcomes a growing emphasis on the use of the cleanest energy sources across all of Europe. Provided that they are produced in a sustainable manner, natural gas and renewable energy sources take on a strategic dimension in this respect. However, tapping the full potential of clean energy requires strong political leadership to secure adequate investment, regional co-ordination of networks and a more integrated European energy market.

6. The Assembly notes a wide variety of national positions and public anxiety across Europe regarding the exploration and exploitation of unconventional fossil fuels, in particular shale gas and oil. It shares the concern about the environmental, public health and seismic risks inherent in the use of hydraulic fracturing, or "fracking", technology. Robust precautions are necessary to protect surface and underground water resources, as well as air and landscape. Cleaner technologies therefore need to be developed for the commercial exploitation of shale gas and oil.

7. The advantages and disadvantages of nuclear energy continue to polarise opinions of policy-makers in Europe. While nuclear energy is perceived by many as clean and affordable, it worries others because of safety and long-term waste disposal challenges. The Assembly considers that nuclear energy will remain part of Europe's energy landscape for reasons of security of supply, competitiveness, low carbon emissions and a global growth potential, but requires stricter safety risk policies and long-term solutions for nuclear waste management.

8. The Assembly is deeply concerned about the problem of energy poverty which affects at least 1.5 billion people worldwide who have no access to electricity and up to 32% of the population in different European countries that faces more or less severe energy deprivation. In this context, the Assembly underscores the responsibility of governments for employing targeted assistance to help the poorer countries move to a more dynamic, but also more sustainable development model, and to protect the most vulnerable populations.

9. In the light of the above considerations, the Assembly recommends that the Council of Europe member States:

9.1. as regards regional, pan-European and international co-operation in favour of sustainable energy:

9.1.1. strengthen the European Emission Trading System and seek its expansion to non-European Union countries;

2. Draft resolution adopted unanimously by the committee on 12 November 2013.

9.1.2. improve market and regulatory frameworks for cross-border clean energy investment (in both networks and technologies) and nuclear safety;

9.1.3. foster the consolidation of regional energy markets and fair competition among all energy market players;

9.1.4. develop transfrontier electricity transmission, interconnection and storage capacities, including the development of the Mediterranean solar plan;

9.1.5. work towards the gradual de-indexing of natural gas prices from oil prices for supply contracts so as to take advantage of lower prices in the international market;

9.1.6. exploit options for pooling means of national energy production (covering infrastructure, imports, back-up capacity and supply-demand management) and enhancing the co-ordination of transmission networks on a regional basis so as to better tap the potential of the European market;

9.1.7. adequately inform, consult and involve citizens in the preparation of clean energy projects;

9.1.8. promote the exchange of best practice in the field of energy technologies, research, legislation and regulation;

9.2. concerning national and European macroeconomic policies for underpinning transition to a more sustainable energy future:

9.2.1. seek structural changes that promote balanced economic, environmental and social development with less energy from fossil fuels;

9.2.2. give priority to better exploiting the most abundant, clean, cost-efficient and locally present energy sources, in particular renewables such as biomass;

9.2.3. foster investment in enhancing energy efficiency throughout different sectors, notably buildings, transport and industry, including by tightening emissions standards and certification requirements;

9.2.4. use the transition to cleaner and more efficient energy to create or preserve jobs;

9.2.5. ensure coherent and specific legislative frameworks, fiscal incentives and pricing signals for investment in clean energy;

9.2.6. penalise wasteful and polluting energy users through carbon or environmental taxes and provide targeted support to the most vulnerable consumers;

9.2.7. eliminate subsidies to fossil fuels, but consider temporary financial support for the shift to the cleanest technologies, the modernisation of energy infrastructure and efforts to reduce energy intensity;

9.2.8. apply the highest environmental, legal and technological standards and strong measures to protect public health and the environment in case of any exploration or exploitation of unconventional fossil fuels (in particular shale gas and oil) and step up research on cleaner alternatives to hydraulic fracking;

9.2.9. continue the integration of local electricity and heat markets;

9.2.10. actively support the deployment of smart grids, waste-to-energy technologies, and fuel storage facilities, as well as the use of solar, wind and biomass energy sources, clean coal and carbon storage technologies, and innovative developments such as service networks for alternative vehicles;

9.2.11. continue to diversify energy supply routes, sources and suppliers so as to reduce dependence on imports and minimise supply disruptions and costs.

B. Explanatory memorandum by Ms Barnett, rapporteur

1. Introduction: energy and Europe's input to "the future we want"

1. Energy supplies are central to sustainable development and the quality of life. The way we make, deliver, share and use energy has multiple effects in the social, economic, political and environmental spheres, which interact closely together and determine whether our development is of the kind that "meets the needs of the present without compromising the ability of future generations to meet their own needs".[3] 2012 – declared by the United Nations the "International Year of Sustainable Energy for All" and marked by the milestone declaration on "The future we want" at the Rio+20 Summit on Sustainable Development – has put energy issues in the spotlight of balanced development policies.

2. The Parliamentary Assembly has repeatedly insisted on the importance of energy co-operation – including as regards diversification – across Europe as a major strategic interest and more recently in the light of Europe's ambitious environmental commitments under the Kyoto Protocol. The continuing economic crisis has somewhat diminished the enthusiasm or capacity of many European countries to keep the pace of cutting greenhouse emissions which is increasingly perceived as a competitive disadvantage in the global context. The crisis also accentuated the precarious socio-economic situation of many Europeans who have to pay rising energy bills from shrinking income and are less eager to pay more in order to support the development of renewable energy sources.

3. At the same time, the Organisation for Economic Co-operation and Development (OECD) countries have developed the Green Growth Strategy that explicitly endorses new thinking on the transition to a greener development model and new approaches to a sustainable energy future. This strategy flows from the awareness that global demand for energy is inexorably rising because of fast population growth and evolving consumer needs, as greater prosperity requires even more – and more diverse – energy.

4. The European Union, for its part, has resolved to reach by 2020 three goals on climate and energy: to cut its greenhouse gas emissions by 20% below the 1990 level; to cover 20% of its energy needs from renewable sources; and to shrink its energy consumption by 20% through better energy efficiency. The European Union Energy Roadmap 2050, adopted in 2011, seeks to further cut emissions to 80% to 95% below the 1990 level. Indeed, as about two thirds of global greenhouse gas emissions (and some 80% in developed countries) stem from the energy sector – mainly the use of fossil fuels –, sweeping changes are needed to reverse the trend and stop the overheating of our planet. The clean energy challenge is thus part of a broader shift to a green economy with a much smaller ecological footprint of human activities.

5. Against this background, the 2011 nuclear power accident in Fukushima has had vast repercussions on the energy mix and strategies for the future in Europe. Whereas the world outlook for expanding nuclear industry was becoming positive before the accident, notably due to efforts to mitigate climate change, the current prospects are more uncertain or outright negative in some countries (including my own). This in turn raises pressure to better tap the potential of alternative energy sources without penalising development.

6. This report thus takes into account a number of motions initiated by members of the Assembly's former committees on economic and environmental issues ("Energy diversification, a common European economic interest", Doc.12514; "Investing in low-carbon economy for growth and development", Doc. 12495; "Offshore wind farms: an economic and ecological opportunity for Europe", Doc. 12552; and "Towards a new energy strategy in Europe", Doc.12600). It refers to expert contributions[4] and presents a cross-sector overview of the energy diversification challenge in the context of European commitment to sustainable development. It then formulates proposals for action by the Council of Europe member States and their institutional partners at international level.

7. In addition to my own fact-finding, the committee held an exchange of views on the energy-environment nexus with the President of the Vernadsky Foundation[5] during its meeting in Moscow (Russian Federation) on 20 November 2012. A hearing was also held on the occasion of its meeting in Berlin (Germany) on 15 March 2013, with the participation of the representatives of the International Energy Agency (IEA) and German experts.[6]

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3. This emblematic definition of sustainable development proposed by the Brundtland Commission (the World Commission on Environment and Development) in 1987 lays emphasis on the essential human needs and the understanding of limits to quantitative growth.
4. Such as the exchange of views the committee held with Professor Samuele Furfari on 23 March 2012.
5. Mr Vladimir Grachev, who is also a former member of the Assembly.

2. Europe's energy challenge for pursuing greener, smarter and more balanced development

2.1. Ensuring energy-efficient growth and competitiveness

8. Human and economic development over the last 150 years has made the world an addict to energy consumption. Energy use has been increasing at a steady average rate of 2.3% per year for the entire range of primary energy sources. The IEA estimates that the world primary energy demand could further increase by more than 30% by 2035, with the developing countries gradually diverting energy supplies away from Europe. For European countries, higher demand for electricity (up from 20% of energy supply now to 40% by 2050) will play a significant role.

9. These projections are not necessarily bad news for Europe, which seeks to achieve a more energy-efficient, green growth. But there is clearly a strategic challenge to reduce our energy consumption and energy costs, whilst preserving development capacity, securing jobs and energy supplies, as well as boosting competitiveness in a global context. As the European Commissioner for Energy put it, "More efficient energy use is the key to unlocking massive environmental and economic benefits – and reducing Europe's annual energy bill by around €200 billion. It could also create 2 million jobs by 2020 and … contribute to our energy supply security".[7]

10. Europe has varied energy sources at its disposal – whether domestic or imported. It mainly uses fossil fuels (oil, gas, coal), nuclear energy and renewable sources (hydropower, wind and solar power, geothermal energy, biomass, tidal power), with energy mix varying from country to country. The use of oil firmly dominates in the transport sector, accounting for 70% of oil consumption, and remains difficult to replace, unless major investment is made to deploy electric vehicles.

11. As much as 50% of the energy consumed in the industrialised nations is used for heating and cooling in both industry and households: it is a major area where energy savings need to be achieved, not least through the diversification of sources, technologies and consumption patterns. The challenge is particularly huge in many Eastern European countries where centralised district heating systems waste a lot of energy. Major opportunities lie ahead with the use of modern construction materials (building "passive energy" houses), better insulation (massive refurbishment of older houses and heat-transmission infrastructure), local energy production (to minimise energy losses in transmission networks and to optimise costs) and energy-saving domestic appliances, industrial installations and vehicles.

12. Electricity requirements keep on rising, since the consumption of electricity has so far grown hand-in-hand with the increase in industrial production, welfare, living standards and new needs (in particular due to energy-hungry information technologies). All primary energy sources are used for generating electricity in Europe, with a growing emphasis on natural gas and renewable sources, yet some 60% of primary energy is still lost in the form of heat throughout the conversion process. This calls for more investment in co-generation (making power and recovering heat) and more research into tri-generation technologies (generating power, heat and cold).

13. The development of renewables is very uneven across Europe and requires more efforts to offset inconveniences such as intermittency and occasional need for back-up capacity, relatively high price (in relation to more conventional energy sources) and difficulties of managing transmission networks during excess generation peaks.

2.2. Integrating environmental ambitions

14. Europe's appetite for energy is not without consequences on the environment. Energy production and use has been shown to increase air and water pollution, greenhouse gas emissions,[8] risks to biodiversity and the depletion of natural resources, with toxic long-term repercussions on human health[9] and natural

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6. Keynote speakers included: Mr Didier Houssin, Director for Sustainable Energy Policy and Technology, IEA; Dr Patrick Graichen, Deputy Director of Agora Energiewende ("energy rebound"); and Mr Andreas Jung, Managing Director of the German Energy Agency (Deutsche Energie-Agentur GmbH (Dena)). See document AS/Soc (2013) PV 02 add 2 for the minutes of the hearing.

7. "Europe's energy challenges", Speech by Günther Oettinger, European Commissioner for Energy, on 10 February 2011 in London.

8. These include not only carbon dioxide (CO_2), but also methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons, as specified in the Kyoto Protocol. According to the European Environment Agency, energy-related greenhouse gas emissions remain dominant and account for 80% of the total emissions, with the largest emitting sector being electricity and heat production, followed by transport.

habitats,[10] and boomerang effects on economic actors when the "polluter pays" principle is thoroughly applied.[11] Yet Europe was among the first whistle-blowers to raise the alarm about the unsustainable mode of development, pointing out that there is no "planet B" for human living and insisting on a more balanced, quality-oriented and nature-friendly development path. It has become a staunch global advocate of emissions-cutting under the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the post-Kyoto process.

15. Whilst clean development goals are commendable, greater care should be taken to avoid counterproductive or hasty policy decisions that have unintended consequences, such as in the case of over ambitious targets for biofuel production. This production rapidly entered into competition with the cultivation of crops for food production; in some countries, it is partly responsible for deforestation (due to palm-oil extraction) and finally is controversial from an energy balance perspective (because of the total emissions resulting from the production, transformation and transportation of first-generation agrofuels). Further research is necessary to develop the second generation of biofuels with better credentials in terms of resource use, environmental impact and greenhouse gas emissions. Moreover, policy planning needs to systematically adopt a cross-sector perspective.[12]

16. Another major dilemma for Europe is the issue of exploiting shale gas and oil. If natural gas thus produced seems a cleaner alternative than other fossil fuels, the existing technologies used for its exploitation raise a series of environmental and public health concerns and make it a far less clean fuel than the conventional (pipeline or LNG[13]) gas, namely:

– ground water pollution due to chemicals used in hydraulic fracking and leaks of hazardous substances (heavy metals and radioactive elements) from underground onto the surface;

– respiratory diseases related to the use of silica sand (causing silicosis even with small amounts) during the drilling phase;

– seismic risks;

– wrecked landscapes.

17. Despite the controversy surrounding the risk/benefit ratio of hydraulic fracking technology, some Eastern European countries have started to exploit shale gas (Poland and Ukraine), hoping to overcome their dependence on natural gas imports from Russia. Large-scale exploitation of shale gas or oil in Europe should not be ruled out, but the currently used hydraulic fracking technology ought to be replaced by cleaner and safer technologies that are currently under development (such as electric, thermal or propane fracking techniques). Technological research in this area needs to be stepped up. Moreover, progress with research and development of carbon capture and storage techniques to reduce CO_2 emissions is a welcome innovation that could in future enable greener energy production and use.

18. Other opportunities – such as waste-to-energy processing – should be better exploited across Europe. Recycling part of waste and incinerating the remainder to produce heat and electricity is an increasingly sensible solution for managing both waste and energy. In the European Union, on average 22% of waste is converted into heat or electricity. By burning 49% of its currently non-recyclable waste, Sweden, for instance, ensures heating for about 20% of its urban households and electricity supply to about 5% of households, whilst also observing high environmental standards for filtering out pollutants during the incineration process. Sweden, as well as a number of municipalities in Austria, Denmark, Germany, Switzerland and other European countries, are also very successful in making biogas from organic waste for use in local transport. This makes it possible to reduce CO_2 emissions (by about 75% to 100%) and pollutants compared with fossil fuels.

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9. Notably, environment-related pathologies such as respiratory and cardiovascular diseases, specific types of cancer, as well as chronic and emerging pathologies including immune system impairment, neurological and neurodegenerative illnesses and disruptions of the hormonal and reproductive system (see Assembly Recommendation 1863 (2009) "Environment and health: better prevention of environment-related health hazards").

10. See Resolution 1682 (2009) and Recommendation 1883 (2009) on the challenges posed by climate change and Recommendation 1823 (2008) on global warming and ecological disasters.

11. See Recommendation 1879 (2009) on renewable energies and the environment; Resolution 1679 (2009) on nuclear energy and sustainable development; Resolution 1588 (2007) on radioactive waste and protection of the environment; and Resolution 1629 (2008) on the OECD and the world economy.

12. See Resolution 1667 (2009) on growing food and fuel.

13. Liquefied Natural Gas.

2.3. Combating energy poverty and vulnerability

19. According to the International Energy Agency, there are currently some 1.5 billion human beings without access to electricity, and the figure could still be as high as 1.3 billion in 2030. This issue of energy poverty is a key concern from the ethical standpoint, because as long as those peoples have access to nothing but scarce local energy sources (such as biomass), their standard of living, education and economic development will lack adequate progress and development opportunities enjoyed in industrialised countries. Narrowing the gap will require more targeted development co-operation, not least in order to ensure a smoother transition of the poorer countries to a more dynamic development model whilst also helping them embrace environmental considerations to counter climate change and to limit greenhouse gas emissions.

20. A different kind of energy poverty is affecting some of the European population. Energy poverty (also called fuel poverty) in this context refers to a situation where households are unable to access – socially and/or materially – a sufficient level of energy services (for example to pay their energy bills for electricity, natural gas and heating supply). The main causes of energy poverty stem from (a combination of) low household income, energy-inefficient homes and the organisation of energy supply system in a given country. If energy poverty negatively affects the quality of life and social attainment of the persons concerned, it also has a particularly strong detrimental effect on health.

21. European Union-wide studies show that on average between 13% and 32% of the population (or between 50 to 125 million households) in different countries face more or less severe energy deprivation. The highest rates of energy poverty are prevalent in eastern and southern Europe, where certain population groups, such as pensioners and the unemployed, are particularly vulnerable. Surveys show that energy poverty is a growing problem across Europe and that it will further escalate in coming years as a result of expected increases in energy prices and largely stagnant household income.[14] The issue therefore requires greater attention from policy-makers in order to improve the situation. Action is necessary across a range of policy fields, including social welfare, consumer protection, taxation, energy prices and tariffs, as well as domestic energy efficiency, with special emphasis on heating and insulation improvements.

2.4. National strategies on shale gas, nuclear energy and meeting the costs of changing the energy balance

22. Many observers and analysts of the energy situation agree that Europe stands at a crossroads of far-reaching political, economic and environmental challenges. Whereas we need a more integrated European energy market and strong political leadership in these uncertain times, the outlook for a common European path in energy matters is rather fragmented, with various countries pursuing policies that they believe are of vital national interest. Hence, although we definitely need a more united, more European approach, notably for delivering long-term investment in cross-border energy infrastructure, national energy strategies remain key drivers and factors for faster progress “on the ground”.

2.4.1. To tap or not to tap unconventional fossil fuels, including shale gas and oil

23. The European Union’s Energy Roadmap 2050 points out the potential of unconventional fossil fuels – such as shale gas and oil – as a new source of energy supply to contribute to the shift to a competitive low-carbon economy. Indeed, Europe’s conventional gas production is declining and imports are rising. More gas is expected to substitute coal and oil in the short- to medium-term so as to help massively reduce greenhouse gas emissions. It should, moreover, help ensure reliable and flexible back-up power for intermittent renewable energy sources. Exploitation of unconventional fossil fuels could also be seen as an opportunity for economic development in certain regions.

24. Regarding shale gas exploration and extraction, European companies are clearly lagging behind the US-based multinational energy giants. The rush for shale gas in the United States in recent years has radically transformed local energy market, lowered gas prices, boosted job creation and spurred hopes of industrial renaissance, despite frequent, significant and unresolved environmental set-backs. Yet despite the bold estimates that the United States[15] could become a leading oil and gas producer – on a par with Russia and Saudi Arabia – by 2017, a number of energy experts warn that the shale gas and oil phenomenon, although spectacular at present, is likely to be short-lived.

14. See a study on “Energy poverty in the EU: a review of the evidence” by Dr Stefan Bouzarovski-Buzar, University of Birmingham.

25. Indeed, a typical life-cycle of shale gas/oil well rarely exceeds five to seven years as production declines rapidly from the first years of exploitation. According to French energy company Total, extracting shale gas and oil requires deep-drilling of 10 to 100 times more wells than for conventional oil and gas, which necessitates constant and significant reinvestment. There are strong doubts about the economic rationale of such an endeavour. However, we cannot ignore the phenomenon. Progress in developing alternative fracking techniques will be key to tapping shale gas or oil resources in a safe and cost-efficient manner. Environmental hazards, human health protection and risk management also have to be duly reflected in the adaptation of national legal frameworks and corporate business plans.[16]

26. Austria and other countries, meanwhile, have developed a promising fracking technology using water, sand and corn starch only instead of a chemical mixture in the fracking fluid. Other improvements in water use – including on-site closed-loop water recycling and steel storage tanks for used water – offer possibilities to minimise water volumes, surface spills and traffic related to waste water transportation. That being said, seismic risks and fugitive methane emissions,[17] as well as landscape and air pollution, remain major concerns. Consistent application of the precautionary and "polluter-pays" principles is therefore essential.

27. Throughout most of western Europe, the interest in shale gas/oil is currently limited to cautious experimental exploration (such as in the United Kingdom) to determine possibly recoverable resources. Some countries, such as Denmark, Hungary and Lithuania, are planning exploration or have undertaken drilling (for example Poland, Sweden and Ukraine). Initially optimistic estimates have been shown to deliver much less in practice. Moreover, investment in shale gas ousts investment in other perspective, but underdeveloped throughout most of Europe, energy sources, notably renewables. The same is true for the other types of unconventional gas, including tight gas and coal bed methane, whose resources are rather abundant and increasingly accessible.

2.4.2. Nuclear energy challenges

28. As far as nuclear energy is concerned (it represents 28% of power generation in the European Union), it has long polarised public opinion, and various European countries have adopted widely differing strategies. The nuclear accidents of Chernobyl (1986) and Fukushima (2011) had a major impact. In their aftermath, safety of existing nuclear plants had to be re-examined in a new light, the planning of new ones reconsidered and the decommissioning of older ones accelerated. Thus after Fukushima, Germany, the largest European economy, decided to phase out nuclear power by 2022;[18] Belgium and Switzerland plan to phase out nuclear plants by, respectively, 2025 and 2034; Spain is not building any new reactors and Italy will not be returning to nuclear energy in the near future.

29. Other countries, such as Russia, France, Finland, Ukraine, Bulgaria, the Czech Republic, Hungary, the Netherlands, Romania, Slovakia and the United Kingdom, continue to consider nuclear energy as a pillar of their national strategies to secure energy supply. This is in spite of the fact that no sufficiently good solutions have yet been found for the safe waste processing of nuclear waste and long-term storage. Current waste disposal measures simply put the burden of a definitive solution on the shoulders of future generations.

30. Whatever the national choice, nuclear energy will remain part of Europe's energy landscape for reasons of security of supply, competitiveness, low carbon emissions, jobs and global growth potential. This is despite continued concerns about long-term safety, radioactive waste management (removal, processing, transport and disposal), financing needs, legal standards and liability in case of accidents. We should recall, in this context, proposals put forward by members of this Assembly for taking better precautions and measures for handling seismic risks in Europe, as reflected in a motion for a recommendation on earthquakes and nuclear safety.[19]

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15. HIS, a global information and analysis company, estimates that in 2012 domestic unconventional oil resources helped reduce the trade deficit of the United States by about US$70 billion (or about 10%) and unconventional oil and gas together generated some US$238 billion in economic activity, 1.7 million jobs and US$62 billion in tax receipts. For more information, see the special report on America's competitiveness in *The Economist* of 16 March 2013.

16. Reports of the European Parliament on industrial, energy and other aspects of shale gas and oil (document 2011/2309 (INI); rapporteur: Niki Tzavella) and on the environmental impacts of shale gas and oil extraction activities (document 2011/2308 (INI); rapporteur: Boguslaw Sonik) adopted on 21 November 2012 call for continuous technological improvement and alternatives towards a more sustainable and safe development of shale energy resources.

17. Methane is a far more powerful greenhouse gas than CO_2. Methane leakage rates in the United States during the hydraulic fracking process are about 2% to 17% of the annual gas and oil production, according to the National Oceanic and Atmospheric Administration.

18. Germany shut eight of its oldest nuclear power plants in 2011 and will close another nine plants in 2015, 2017, 2019, 2021 and 2022. Despite this move, the country remains a large-scale exporter of electricity.

2.4.3. Pricing considerations in changing the energy mix

31. Alternatives to nuclear energy need to be developed further to secure steady, clean and affordable supplies. There is no doubt that this option is costly to both energy producers and consumers, in particular along with a change in energy balance towards more renewables. Indeed, as the OECD estimates show, nuclear-generated electricity is generally cheaper than that from coal, renewables and gas (except where gas is easily accessible).

32. Embracing "green objectives" for energy currently requires extra financial support which translates into higher charges. In Germany, for instance, a switch to renewables has added about 18% to household electricity bills, although wholesale market prices have been stable or even falling since 2008.[20] The difference in prices reflects the wish to keep industry competitive and to induce energy-saving behaviour in households. A global comparison by the IEA also shows that, in 2011, American energy users paid a third of the German gas price and a quarter of the South Korean one, with cheap gas translating into cheap electricity in the United States. Another example from Spain shows that generous public subsidies to promote solar energy grew so much (40-fold over 2007-2012) that they had to be drastically cut to alleviate the burden on the national budget.

33. A thought should be given as to how the existing emission trading schemes and taxation systems could be adapted to help compensate part of the cost burden more equitably across society, so that all stakeholders – the State, businesses and consumers – could contribute a fair share. For example, when some European countries implement a tax on financial transactions, supplementary revenue could in part feed green energy investment and job creation in this field. Another valuable source is various forms of carbon or environmental taxes that make polluters pay. At the same time, in order to level the playing field for different sources of energy, market-distorting subsidies[21] for the most polluting energy sources, namely fossil fuels, have to be eliminated.

34. To get incentives right and to adjust to the changing economic climate, the European Union is debating ways to reform its Emissions Trading System so that prices for emission permits (now at historically low levels – down to €3 to €5 per ton from about €25 per ton in 2008) would give a stronger push to cleaner technologies and make big polluters contribute more in the transition to not only greener, but also more adequately priced energy for all users. The paradox of prices is such that some large European electricity makers in the last few years have turned away from using gas to burning cheaper but more polluting coal against the backdrop of low-priced emission permits and an influx of coal exports from the United States. If nothing is done to curb the rise in gas prices and to penalise coal burning, this phenomenon could become entrenched and would undermine environmental objectives.

3. Energy diversification path in terms of sources, suppliers, technologies, consumption patterns and investment policies

3.1. Current trends and new opportunities

35. As the IEA notes in its World Energy Outlook 2012, the global energy map is changing with the resurgence of oil and gas production in the United States, a spread of unconventional gas extraction elsewhere in the world, an expansion in LNG trade, a retreat from nuclear power in some big countries and rapid growth in the use of wind and solar technologies. Developed countries are gradually shifting away from coal and oil to natural gas and renewables. No country appears immune from global trends and a growing interaction between national or regional energy markets and major global consumers (such as the United States, China, Japan, etc.).

36. Worldwide, oil remains the most consumed fuel (33% of the total primary energy), followed by coal (30%), natural gas (24%), hydropower (6%), nuclear energy (5%) and other renewable energies (2%).[22] Global electricity generation is growing rapidly, mainly from fossil fuels (coal 40%, natural gas 21% and oil

19. See Doc. 12928, tabled by Mr Latchezar Toshev and others.
20. According to the EWE Group, an energy company, the renewables support scheme accounts for 18% of the electricity price in Germany (including a 0.8% contribution for the offshore wind scheme). Network fees account for 23.5% and other taxes total 27.4%, while the purchase of physical energy weighs only 20% in the electricity price.
21. Global subsidies to fossil fuels, according to the IEA, amounted to US$523 billion in 2011. This is six times more than subsidies to renewables.
22. See various BP Statistical Reviews of World Energy.

5%), while the nuclear sector provides about 13% and renewable sources deliver about 20%. According to American expert estimates[23] regarding non-conventional gas reserves, the world has about 456 billion m^3 (of which 180 billion m^3 are technically recoverable), including 18 billion in Europe.

37. The energy mix of most European countries remains dominated by oil, followed by gas, coal, nuclear power and renewables, although the latter two sources are preponderant in some countries. Thus, Belgium, France and Slovakia rely significantly on nuclear energy; Albania, Austria, Georgia, Iceland, Latvia and Norway have a very strong renewables sector (mainly hydropower), whilst in Slovenia, Sweden and Switzerland both the nuclear and the renewable sectors are important. Only a handful of countries are currently self-sufficient in energy from domestic resources in fossil fuels; however renewables that are waiting to be tapped. The European Union as a whole has to import about 82% of oil, 57% of natural gas and 97% of uranium it needs.

38. After the Fukushima shock, Japan started to divert LNG from Europe, and a further change occurred with an increase in coal exports from the United States which now uses more domestic shale oil and gas for its own needs. Against the background of global climate warming, major hopes are pinned on recovering the deep-sea energy resources in the Arctic region, which is believed to hold massive oil and gas reserves (equivalent to about, respectively, 13% and 30% of the world's estimated undiscovered resources) and for which the United States, Canada, Greenland, Norway, Iceland and Russia are the main competitors in the race.

39. Renewable energy sources are widely seen as a driver of economic and technological progress. They are increasingly used to replace aging infrastructure for energy production – even in countries like China and Russia – and become particularly important for underpinning sustainable development. The OECD and the IEA advocate an energy technology revolution (using existing and new technologies) to shift towards a sustainable energy future and green economy. Achieving this breakthrough will require major investment in improved energy efficiency, calibrated recourse to carbon capture and storage, increased deployment of renewables and continued efforts to switch to cleaner fuels.[24]

40. Considering that renewable energies represent a significant and growing share of energy supplies in Europe (some 23% in 2012 – up from 13% in 2002)[25], it is important for all potential investors that the European Commission establishes planning security by setting up general political conditions for the promotion of renewable energies at an early stage. The aim of a renewable energy policy up to 2030 should be to set new obligatory targets for the member States to expand the renewables sector and to better co-ordinate national strategies to that end. In the longer term perspective, national support mechanisms should be further developed and be better integrated into a European system.

41. The benchmark for determining adequate prices could be the greenhouse gas avoidance costs, provided that numbers of the CO_2 certificates issued are properly controlled through the European Emissions Trading System. A recent proposal by the European Commission to freeze the sale of CO_2 certificates is to be welcomed in general, although in the long term, it will fall short of expectations both in terms of meeting targets for cutting emissions and ensuring a viable economic situation for the companies concerned. A gradual rise in the cost of emission certificates seems to be necessary because a low price gives little incentive for enterprises to invest voluntarily in climate protection. In principle, it would be desirable to control the emissions' trading and the management of the CO_2 certificates through a central body modelled upon a central bank. This would also have an impact on the applicable price.

3.2. Geopolitical issues and European co-operation

42. As the IEA representative highlighted at the committee hearing on 15 March 2013, energy use is escalating in developing countries with large and expanding economies. Limiting a global rise in temperature to just 2°C requires massive reductions in greenhouse gas emissions worldwide and a more sustainable use of existing resources. A collective effort should therefore focus on stabilising energy needs, enlarging the share of the cleanest energy sources and a gradual decoupling of energy consumption from economic and

23. Source: US Energy Information Administration, based on Advanced Resources International, Inc. data.

24. See OECD/IEA Green Growth Studies – Energy, 2011. The British Committee on Climate Change points out that the carbon capture and storage approach has higher emissions over its lifetime than the nuclear or renewables and should hence only be used as part of a mix of technologies, preferably on gas power plants rather than coal-fired plants.

25. Germany, for instance, plans to increase the share of renewables in its power consumption to over 35% by 2020, 50% by 2030, 65% by 2040 and over 80% by 2050, whilst simultaneously reducing overall energy consumption by some 10% by 2020 and about 25% by 2050 in comparison to 2008. This would enable the country to achieve a carbon-neutral economy by 2050.

demographic growth. A vision of a sustainable energy system for the future needs multi-party co-operation and long-term oriented action on many fronts, notably with regard to security of supply, a rational cost/benefit balance, jobs, energy savings, network interconnections and technological research.

43. Much of the progress will depend on our ability to innovate and experiment with new cost-effective solutions. These are highly needed to improve energy efficiency, storage techniques for power generated from the renewables and energy use in the transport sector, and could be achieved not least by investing more in energy-efficient vehicles and "greener" fuels. Carbon capture and storage techniques for the industry, although promising, are not yet sufficiently ripe but could prove useful as part of technological diversification in energy production. Moreover, the advent of third- and fourth-generation reactors for nuclear power – with optimised safety mechanisms, smaller size and longer life expectancy[26] – might give a new impetus for the renewal of the aging nuclear park in a number of countries. More progress is necessary to ensure safe processing and storage of nuclear waste.

44. Next to currently used types of energy, including nuclear fission, experimentation with the nuclear *fusion* – a source of clean and plentiful energy – is a very promising energy option for the future. Since 2006, China, the European Union, India, Japan, Russia, South Korea and the United States are actively pursuing co-operation on the ITER (International Thermonuclear Experimental Reactor) project. If the results of the ITER tests on the Cadarache site in France prove to be conclusive, large-scale commercial applications could follow soon.

45. With the growing recourse to renewables, the costs are going down, whilst nuclear energy is becoming more expensive due to extra investments in safety after the Fukushima accident. Although national preferences and choices may differ, various energy sources are mutually complementary. The German experience shows that wind and solar (photovoltaic) power are very attractive: initially costly to install, they have virtually no operating costs and by 2015 could produce electricity at the same or even lower prices as gas- and coal-fired plants. However, hydropower and geothermal power may be more appropriate in other countries.

46. A major task for Europe now is to adjust emissions pricing for enterprises and energy charges for households so as to encourage them to embrace climate-smart technologies, energy sources and behaviour patterns. This would also strengthen European leadership in the global negotiations over the post-Kyoto agreement. Greater use of natural gas – with certain environmental precautions – instead of oil and coal can help reduce both emissions and pollution during the transition to cleaner energy alternatives. Concerning the unconventional gas challenge, the IEA is promoting a set of seven "golden" rules for the interested parties. Finally, energy efficiency remains a huge opportunity in all countries[27] and should be a top strategic priority.

47. During the hearing, energy experts underscored the need for more consultation and co-ordination on energy choices at various levels of governance across Europe. Increasingly, optimal solutions are emerging by combining capacities and goals on a regional basis, as well as using fully the potential of the European Union's internal market. From a policy-making angle, it is urgent to resolve the subsidies' issue so as to reduce market distortions and facilitate the development of renewable energy sources. Moreover, with the growing reliance on wind energy in the North and solar power in the South, including in its Mediterranean neighbourhood, Europe and its closest partners need enhanced interconnections, transmission networks and multi-stakeholder management to minimise disruptions and costs.

48. Major challenges thus concern financing large-scale infrastructure projects, handling intermittency (of power generation from renewables), imports (primary energy, transformed fuels and electricity) and peak energy demand, ensuring sufficient back-up capacities (from fossil fuels, biomass, etc., and also storage systems) for occasional use and improving flexibility of national energy markets and networks. In this context, further development and deployment of "smart grids" seems necessary: this concept, coined around 2005, builds on the use of information technologies to collect and act on data on the behaviours of suppliers and consumers in an automatic way to improve efficiency, reliability, costs and sustainability in electricity production and distribution.[28]

49. One feature of Europe's energy market that requires greater attention of policy-makers is the indexing of natural gas prices to oil prices in long-term contracts, which prevents many European users from taking advantage of lower prices in the international gas market (so-called spot pricing).[29] In fact, nearly two thirds of

26. 60 years as compared to about 30 years in existing reactors.
27. Mainly in buildings, power generation, transport and industry with unrealised energy efficiency potential of 80% to 60%.
28. See the conclusions of the European Union Council Summit of 22 May 2013.

Europe's gas supplies are still dominated by oil-linked prices. This aberration, viewed as a historical accident by some analysts, dates back to the 1960s when natural gas was seen as a by-product of oil extraction. Nowadays, the situation is very different and Europe's main gas importers are pressing for the delinking of gas and oil prices in long-term contracts – despite resistance from large suppliers in Russia and North Africa. Norway, meanwhile, has already accepted to sell half of its gas to Europe at spot prices. This shows that a more balanced, modern partnership between buyers and sellers is possible without undermining long-term supply and investment security and competition in energy markets. Moreover, the de-linking would help reduce average gas prices versus coal and hence foster the use of gas as a bridging fuel for cleaner electricity generation.

3.3. Macroeconomic choices and regulatory responsibilities

50. Bearing in mind climate objectives, social needs and the ambition to "green" the economy, huge efforts will be necessary to ensure more sustainable production and use of energy. On the one hand, large-scale overhaul of infrastructures (for energy, habitats, transport, industrial facilities, etc.) is needed to either renew or adapt them to more efficient performance. The fruits of research and innovation will have to be fed steadily into the systems to facilitate this quality leap towards less energy-dependent development. On the other hand, more structured regulatory guidance and long-term interest of society have to orient stakeholders and accompany the change. This means shared responsibility by the private sector, public authorities and civil society to make the shift happen.

51. The most obvious shortcut to a cleaner energy future are energy efficiency and savings. Too much energy is wasted in production and transmission as useless heat and pollution. According to the IEA, if various energy efficiency measures were implemented, global emissions resulting from human activity could be reduced by about 30%. Another 10% could result from the phasing out of subsidies to fossil fuel consumption. Comparisons of energy intensity at national level reveal that there is much scope for action across Europe: energy used to produce US$1 000 of gross domestic product (GDP) varies from about 100-150 kg of oil equivalent in western European countries to over 200 in most of central and eastern European countries, reaching over 400 in Belarus, the Russian Federation, the Republic of Moldova and Azerbaijan, and over 600 in Ukraine.

52. Improvements could be achieved through targeted investment: the World Bank estimates that every US $1 invested in energy efficiency reduces energy production needs and investment by about US$2. In addition, jobs are created and costs are reduced over the medium term. Regulatory measures should incentivise investment in energy efficiency and penalise wasteful or polluting users.

53. Modernisation is particularly needed in the housing sector (residential, public and commercial buildings) which consumes about a third of all energy used in Europe. To this end, national action plans should cover environment-friendly public procurement policies, energy efficiency and renovation of older buildings (insulation, lighting, heating and ventilation systems), incentives for the installation of "green" heating systems (heat pumps, combined heat and power cycles), certification requirements, labelling and information instruments (such as campaigns).

54. Moreover, some countries like Germany use energy-efficient refurbishment programmes as part of the economic stimulus package to beat the crisis and create, or maintain, jobs. It is estimated that for every € 1 billion invested in energy efficient buildings, about 25 000 jobs are created. Similar gains are expected in other countries, such as in Hungary, where a study shows that building renovation centred on energy efficiency has the greatest job creation potential compared to other types of climate change mitigation measures.

55. Energy efficiency in the transport sector has a huge potential not only in terms of energy balance, but also for reducing pollutants, noise and congestion. Infrastructure investment, technological innovation, taxation (for vehicles, roads, fuels, etc.) and integrated urban-rural planning are the main axes for action so that sustainable mobility and energy go hand in hand. Strategic choices need to be made rapidly with regard to mass production of alternative vehicles (electric, hybrid, using biofuels or compressed gas and even hydrogen) and the deployment of service networks.

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29. Thanks to a massive supply of unconventional gas in international markets and rapidly expanding alternative energy sources (such as renewables), the US gas prices have fallen to about US$2-4 per million British thermal units, compared to US$9-10 in Europe.

56. Finally, appropriate regulations are needed to avert a mere relocation of energy-intensive industrial activities – and jobs – outside Europe. What Europe should export is not pollution, but clean and energy-efficient technologies. It should also promote cost-reducing modernisation of its older industries and energy infrastructure so as to optimise energy use.

57. Across Europe and beyond, there is a growing consensus and political support for the development of renewable energy sources which will have to become a central part of the energy mix. To achieve economies of scale for renewables and hence to reduce their costs, there is a need for greater market integration (combining local, national and international levels) and smarter business models.[30] Governments have to send strong signals to the private sector which is expected to provide about 80% of capital funds for the green transition. To ensure a more balanced risk-sharing and the pooling of capacities, public-private partnerships could be more often used for projects with the greatest impact potential.

4. Conclusions and recommendations on strategies for the future

58. A new energy landscape is emerging in Europe and beyond. It is part of a broader society's ambition to embrace a green development model, notably in the light of commitments under the Rio+20 Summit on Sustainable Development and the Kyoto Protocol. The transition to a more sustainable energy future offers a wealth of opportunities for European businesses, households and public authorities. However, it also demands sustained investment efforts and innovation, trade-offs and patience by all players, as well as explicit public support and guidance. If the binding goals on clean energy for the European Union are set in a series of road maps, strategies and directives, individual member States and non-European Union countries have a lot of margin – and responsibility – for national energy choices.

59. Although a single European vision for a clean energy future does not exist, there is a growing political consensus on the need to cut emissions and make better use of existing resources. We need to optimise our energy needs, enlarge the share of cleanest energy sources and gradually decouple energy consumption from economic and demographic growth. As highlighted throughout this report, the key to unlocking sustainable energy potential in Europe lies in energy efficiency, more renewables and an integrated approach to energy diversification, including for the housing sector, transport and industry. The aim is to reduce emissions, pollution and dependence on fossil fuels, but also to enhance our competitiveness, job creation and well-being.

60. Energy dialogue and co-operation between the European Union and non-EU countries, at regional level and with Europe's partners worldwide, is a must. They should help build synergies and interconnections, pool resources and capacities, share best practice and deploy cutting-edge technologies. Targeted solidarity mechanisms need to be activated so as to eliminate energy poverty, ensure better informed end-user decisions and win people's minds in favour of clean energy strategies.

61. The following main recommendations ought to be put forward by the Assembly to member States:

– Seek structural changes that promote balanced economic, environmental and social development with less energy from fossil fuels;

– Give priority to better exploiting the most abundant, clean, cost-efficient and locally present energy sources, i.e. renewables;

– Enhance energy efficiency and savings throughout different sectors, notably buildings, transport and industry;

– Use the transition to cleaner and more efficient energy to create or preserve jobs;

– Ensure right pricing signals and incentives for clean energy;

– Improve market and regulatory frameworks for clean energy investment (networks and technologies) and nuclear safety;

– Strengthen the European Emission Trading System and seek to expand it to non-European Union countries;

– Penalise wasteful and polluting energy users through appropriate taxation instruments, and provide targeted support to the most vulnerable energy users;

30. "Greening the economy: mainstreaming the environment into economic development", UNECE (United Nations Economic Commission for Europe), September 2011.

– Eliminate subsidies to fossil fuels, but consider temporary financial support for the shift to the cleanest technologies, the modernisation of energy infrastructure and efforts to reduce energy intensity;

– Foster co-operation in regional energy markets and competition among energy market players;

– Take the necessary precautions for exploring and exploiting unconventional gas resources;

– Continue the integration of electricity and heat markets;

– Develop transmission, interconnection and storage capacities at national and regional level;

– Actively support the deployment of smart grids, waste-to-energy technologies, storage facilities and service networks for alternative vehicles;

– Tighten emission standards and certification requirements;

– Diversify energy supply routes and suppliers;

– Adequately inform, consult and involve citizens in the preparation of clean energy projects.