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**RE-EVALUATING ENERGY SECURITY IN THE LIGHT OF
RECENT DEVELOPMENTS**

I. EXECUTIVE SUMMARY

1. Energy security is at the core of energy policy. The need to ensure secure and reliable energy supplies at affordable and stable prices over the short and long term is an integral part of any sound and consistent energy policy.
2. While energy security is a multifaceted concept and not easy to define, there are three dimensions of particular relevance: physical disruption of supplies due to infrastructure breakdown, natural disasters, social unrest, political action or acts of terrorism; deleterious effects on economic activity and peoples due to energy shortages, widely fluctuating prices or price shocks; and collateral damage from acts of terrorism resulting in human casualties, serious health consequences or extensive property damage.
3. Concern about energy security in ECE countries has grown and waned over the years. This concern was uppermost in the minds of energy policy makers during the 1970s and early 1980s when energy supply and demand were tightly balanced and energy markets were rocked by two sharp oil price rises. Likewise, concerns were heightened during the Iraqi-Kuwaiti crisis of 1991.
4. Now, anxieties have re-emerged; energy security is once again high on the agenda of policy makers and the general public. The increased sense of vulnerability and insecurity is fuelled by concerns regarding:

- the growing dependence of ECE countries on imported energy;
- the increasing reliance on oil from OPEC and the Middle East;
- the uncertainty about the full implications of market liberalization and its eventual impact on the energy security of countries;
- the way energy-related environmental problems and issues, and most notably on climate change, are eventually resolved;
- the potential narrowing of future energy options because of concerns regarding safety, the environment and other factors;
- the perceived higher costs of new incremental energy supplies;
- the ever increasing distance of supply routes between producing and consuming centres;
- the security risks and dangers of terrorist attacks on energy installations, such as nuclear power plants and oil and gas facilities;
- the potential for social unrest and ethnic strife in a number of energy producing and transit countries.

5. Past measures and policies to foster energy security, notably those implemented during the 1970s and early 1980s, proved successful. Unfortunately, with relatively “easier” energy markets since the mid-1980s, public concern about energy security, and the attention devoted to it by policy makers, receded somewhat, with complacency settling in. However, the situation today calls for greater vigilance and renewed action by governments as well as the private sector and the general public.

6. Past measures need to be re-invigorated as well as adjusted and strengthened where warranted, and new measures taken in the light of emerging developments. Policy action is required to:

- accelerate the introduction of measures to improve energy conservation and efficiency;
- diversify sources of energy supplies;
- ensure that the energy mix, in terms of types of energy consumed, is varied and well diversified;
- assess and, where necessary, improve the protection and safety of energy infrastructure against possible acts of terrorism;

- encourage the development of indigenous (domestic) supplies;
- stimulate the development and commercialisation of new and renewable sources of energy;
- promote research and development in fossil fuel technologies to enable the continued use of fossil fuels at no or low levels of polluting emissions;
- build up and maintain strategic stocks as well as encourage the holding of commercial stocks, where warranted;
- encourage international dialogue and cooperation between energy consuming and energy producing countries.

7. This renewed attention and concern over energy security in ECE member countries has refocused the debate on a number of important and thorny energy policy issues. Policy decisions are now being re-evaluated with respect to: the role of coal and nuclear power in meeting future energy needs; the subsidization of indigenous energy production; the provision of incentives for the exploration and development of fossil fuels; the introduction of measures to improve the commercialisation of renewable energy resources; and the implementation of measures to protect the environment.

8. Three basic objectives currently underpin energy policy in most ECE countries. These are enhancement of energy security, the promotion of economic efficiency, and protection of the environment. In addition, there are numerous other societal objectives that governments need to take into account in policy making. These societal objectives/ goals cannot be furthered and achieved simultaneously. Over the short and medium term, there are usually inherent and inescapable trade-offs that need to be made, involving competing policy goals and policy means.

9. Such short-term trade-offs are unavoidable. What is crucial is that the constellation of measures taken by governments, the private sector and general public over time leads ultimately to a sustainable energy future, that is, a future with secure, reliable energy supplies/services at affordable prices, produced and consumed without harm to both human health and the environment.

10. It is also important to recognize that strengthening international relations and economic cooperation among all countries can be helpful in improving energy security. In a number of ECE countries, the rule of law needs to be strengthened, commercial contracts protected and the business climate improved. Low standards of living, inadequate economic development and social, ethnic and political unrest in a number of sub-regions of the ECE continue to trouble the region as a whole, and undermine energy security for all. Concerns about energy security cannot be fully separated from and resolved without addressing these broader issues and problems that beset the region.

II. INTRODUCTION

11. The objective of this paper is to review the current trends and developments that are affecting the energy security of ECE countries and consider the policy measures that could be taken in response. The paper begins with a brief discussion of developments relating to energy intensity and efficiency. Then, energy supply and demand trends and their significance for energy security are examined. This is followed by a brief discussion of the implications for energy security of recent trends in market liberalization and the significance of the tragic terrorist events of 11 September. The paper concludes with a brief overview of policy measures required to improve the energy security of ECE countries.

III. ENERGY INTENSITY AND EFFICIENCY

12. Large differences in energy intensity (defined as energy consumption per unit of Gross Domestic Product) exist between ECE countries. Some of these differences are the result of differences in population density, distances travelled between urban centres, climatic conditions and industrial structure and, therefore, are unrelated to energy efficiency. But a large part of the variation in energy intensity levels between countries can be attributed to differences in energy conservation and efficiency levels.

13. The differences in energy intensity among developed market economies is much less pronounced than the gap existing between them and economies in transition. The energy intensity levels in central and eastern Europe and in the CIS region are of an order of magnitude greater than that in western ECE countries. There is, therefore, a huge economic potential for reducing energy intensity in transitional economies.

14. Estimates show that reducing the energy efficiency gap by half, between western and eastern European countries, including CIS countries, would save around 600 million tonnes of oil equivalent of which 90 per cent would be fossil fuels. This is approximately equivalent to the annual imports of oil by western European countries and more than three times the annual imports of natural gas. As an added benefit, harmful emissions of SO₂, NO_x and CO₂ would also be reduced by 20-25 per cent in central and eastern European countries.

15. The central and eastern European and CIS countries have a unique historical opportunity to reduce the overall energy intensity of their economies and improve the efficiency of energy production and use. They are currently in the midst of transforming their economies and implementing broad-based reforms at both the macro and sectoral levels, including the rehabilitation and modernization of their energy infrastructure and facilities. Energy saved can delay the need for new additional sources of energy supplies, including imported energy, and thereby enhance energy security. For the economies in transition, this is an economic as well as an environmental imperative.

16. Despite the relatively high energy efficiency levels already achieved, the developed market economies of western Europe and North America can also do more. Since the drastic drop in crude oil prices in the mid 1980s, the rate of improvement in energy intensity and energy

efficiency in western ECE countries has slowed down markedly. Accelerating energy efficiency improvements would not only contribute to enhancing energy security but would also contribute to the protection of the environment. In many instances, the best way to reduce energy-related environmental problems is to reduce energy consumption.

IV. DEMAND AND SUPPLY TRENDS

(A) Oil

17. Of most significance to ECE countries, in terms of security of oil supplies, are: the growing dependence of ECE countries on imported oil; the concentration of known oil reserves in the Middle East; the growing reliance on the Middle East and, more generally, on the Organization of Oil Exporting Countries (OPEC) for oil supplies; the potential for political instability and social unrest in some of the major oil producing areas; and the transit of oil supplies through areas prone to instability.

18. The dependence of countries in western Europe and North America on oil imports, which today stands at approximately 50 per cent, is likely to rise to around 60 per cent by 2010. For central and eastern European countries (excluding the Russian Federation), oil import dependence, which is currently more than 80 per cent, could rise to around 90 per cent by 2010. Hence, in the absence of measures to offset increased oil import dependence, ECE countries could become more susceptible to world oil supply disruptions or other shocks even though they are now much better prepared to deal with these shocks than they were in the past.

19. Currently, the Middle East supplies about 30 per cent of all the oil consumed in the world. By 2010, this could be around 40 per cent. Surplus production capacity exists in the Middle East and producers can expand this low cost capacity relatively quickly. Moreover, two-thirds of the world's established reserves of crude oil are in the Middle East. With time, reliance on the region for oil is bound to rise. The Middle East has been prone to instability, afflicted by war and political upheavals. This is a fact of international life that energy policy makers cannot ignore.

20. Today, the share of world oil production from OPEC is about 40 per cent. This is much less than the share of 54 per cent in 1973 but considerably more than the 29 per cent share in 1985. The mid 1980s were a turning point for oil and energy generally; worldwide, oil and energy demand started to rise once again in response to lower real oil and energy prices, after having stagnated for a while. Unless there is another reversal, dependency on oil from OPEC is likely to continue to rise; it has risen from 29 per cent to 40 per cent in just over a decade and half. The world's dependency on oil from OPEC could rise to about 50 per cent by 2010 - 2015, close to the levels that existed in 1973.

21. Crude oil price shocks or excessive volatility can have deleterious effects on the economies of ECE countries through changes in the terms of trade and because these shocks are usually transmitted to other energy prices either directly as in the case of petroleum product and natural

gas prices or indirectly for coal and electricity prices. In turn, the level and volatility of world crude oil prices is influenced by the export policy of OPEC countries. Likewise, the long term evolution of oil prices will depend, to an extent, on additions to productive capacity in countries of the Middle East, where known reserves are concentrated and are relatively inexpensive to develop.

22. Hence, crude oil prices and, therefore, other energy prices will remain dependent to some degree on developments in countries of the Middle East and those belonging to OPEC. Obviously, this does not imply that OPEC will invariably be able to always successfully influence world oil prices (upwards or downwards) because there are many factors that impinge on the level and variability of world oil prices. However, OPEC does retain the capacity to influence prices, if only temporarily, and has occasionally in the past been the cause of price volatility or instability. With its market share steadily rising, these problems could potentially resurface in the years to come, even though this would not be in the interests of either producers or consumers.

23. One or more countries of the Caspian Sea region could in the near future become leading exporters of oil. Their vast oil resource potential is already attracting considerable interest. Since most countries around the Caspian Sea are landlocked, transit rights through the territories of third countries will continue to be of vital interest to them. Unfortunately, these have sometimes been difficult to negotiate on commercially acceptable terms in the past. Moreover, oil will have to transit through territories that in the past have been subject to political and social instability and, therefore, oil supplies from these areas could be prone to disruption.

24. The oil price shocks of the 1970s encouraged governments as well as private oil companies to carry more oil stocks. Today, member countries of the International Energy Agency (IEA) that are oil importers are obliged to carry oil stocks equivalent to 90 days of forward consumption. Moreover, the IEA as well as the European Union have oil sharing arrangements in place in case of a significant disruption in oil supplies. While these emergency response procedures are constantly being updated and adapted to reflect changing oil market conditions, they are not sufficient, by themselves, to provide peace of mind; other measures to promote energy security continue to be required.

(B) Natural Gas

25. Natural gas is today's fuel of choice. It is flexible to use, environmentally friendly compared to other fossil fuels, relatively abundant, with supplies perceived to be relatively secure and reliable. Consequently, it is being used in a variety of sectors and applications, and experiencing significant growth as a fuel for electricity generation. Therein lies the source of potential future problems.

26. The rapid growth in natural gas consumption is boosting the import dependence of many European countries. The increased reliance on natural gas could decrease demand for other fuels over the medium term and, thereby, contribute to reducing the diversity and variety of the energy mix available in the marketplace. Over the longer term, however,

meeting demand will increasingly become a challenge as new sources of supply become increasingly more remote and more costly to develop.

27. Total imports by western European countries (from outside western Europe) are likely to increase from about 35% of natural gas consumption to about 45% by 2010, even assuming a significant expansion in Norwegian production. The import dependence of central and east European countries, excluding the Russian Federation, is likely to rise from about 65% to 85% by 2010. On the other hand, the situation in North America is more encouraging; the market is relatively self-sufficient, with gas supplies and transportation infrastructure well balanced and diversified, and likely to remain so for the foreseeable future.

28. The problem of import dependence is compounded when countries have to rely on a single outside source of gas. Most countries in western Europe are now supplied from a number of sources, including indigenous sources of supply. For historical and geographical reasons, this is not generally the case for countries in central and eastern Europe. Almost all the gas imported in these countries, to supplement domestically produced gas, comes from the Russian Federation.

29. So far, the Russian Federation has been a secure and reliable supplier of natural gas to both central and eastern as well as western European countries. Since deliveries began thirty years ago there has been no major interruption of gas supplies. But despite the reliability of Russian gas supplies, the desire of central and east European countries to diversify their sources of supply is understandable. It is an attempt to minimize risks through diversification; unintended accidental disruptions can and do occur.

30. The traditional suppliers, like the Russian Federation, Algeria, Netherlands and Norway, are likely to have the capacity to meet Europe's growing demand for natural gas for some time to come. However, in the longer term, significant new investments in production and transportation infrastructure will be required. Moreover, supplies will increasingly have to be transported over longer distances as new production centres are developed in more remote or distant areas of the Russian Federation, Norwegian shelf, North Africa and the Caspian Sea, and ultimately with supplies coming from the Islamic Republic of Iran.

31. This trend will not only put upward pressure on prices but also add to the vulnerability of gas deliveries; the risk of accidental or weather-related supply disruption, even if it is of short-term duration, will consequently rise. In addition, some supplies will have to come from, as well as transit, areas such as the Caspian Sea region and the Caucasus, which have in the past experienced social unrest and instability.

32. Even today, the transit of natural gas through the territories of third countries is an issue of controversy and potential tension. Transit rights, which are of concern to both gas-exporting and gas-importing countries, are sometimes the issue of intense commercial and political negotiations. The potential for disputes and misunderstandings are ever present.

33. Unlike oil and coal, gas is more difficult to store. Nevertheless, gas companies have increasingly expanded their underground storage capacity not only to take care of daily and seasonal peaking of demand but also for strategic reasons. Moreover the practice, quite prevalent in western Europe, of interruptible supply contracts for large customers, particularly those with dual-firing capacity, is gradually catching on in central and eastern Europe. Both underground storage and interruptible contracts can mitigate to some extent the consequences of short-term interruptions in gas deliveries.

(C) Coal

34. From the point of view of energy security, coal has the advantage that world coal reserves are large; sources of supplies are diversified; ample supplies are available from politically stable regions; world infrastructure is well developed; new supplies can be easily brought on stream; and coal can be stored.

35. On the other hand, the coal and thermal power industries are confronted with environmental problems and, in some cases, the need for costly and painful restructuring. Unless these problems can be successfully resolved, coal could gradually be displaced from the market in the longer term, especially in countries where there are other options. With a significant decline in the market share of coal, the diversity of the fuel mix could be compromised and, thereby, contribute to heightening energy security risks.

36. Broadly speaking, the answer to this conundrum lies with the greening of the coal-energy chain. Existing, commercially viable clean coal technologies offer opportunities to mitigate the environmental impact of coal use at all stages of the coal cycle. Moreover, emerging new technologies (carbon sequestration, gasification and liquefaction) could offer the potential of using coal for power generation with low or no emissions in the future.

37. It is important to recognize that coal and, more generally, fossil fuels are concentrated energy. It took millennia for nature to create these concentrated sources of energy. On the other hand, solar and wind power, and to a lesser extent biomass, are more diffused sources of energy, requiring larger land surfaces and higher investment costs to produce the same quantity of energy.

38. Therefore, it is important to invest in research and development in order to find ways of using fossil fuels, including coal, in a manner that is not detrimental to human health and the environment. While improvements in energy conservation and efficiency can slow down the rate of growth of demand for energy services, they cannot eliminate this demand altogether. Energy services are and will continue to be needed to meet human needs and for economic development. Under present and projected market conditions, the bulk of these energy services will be provided by fossil fuels. Projections by a range of organizations indicate that oil, natural gas and coal are likely to remain the mainstays of global energy supply systems for the greater part of the twenty-first century.

(D) Nuclear Power

39. Since 1973, nuclear power has significantly contributed to meeting rising electricity demand in the ECE region and in reducing dependence on oil for power generation. But since the early 1980s, far fewer orders for nuclear power plants have been placed, stemming in part from public concern and political debate on the possibility and consequences of accidents, on the lack of adequate methods for disposal of nuclear wastes, and over the costs of nuclear power plants themselves, including their decommissioning costs.

40. As a result, the outlook for nuclear power is shrouded in uncertainty. At present, a number of countries (e.g., Denmark, Italy, Austria, Sweden and Germany) have opted not to construct new nuclear power plants and for the phase out of current plants. Other countries, more favourably disposed to nuclear power (e.g., France, Ukraine, United States), are weighing their options.

41. However, there are signs of a revival of interest in nuclear power, as evidenced by the recent decision of Finland to approve the construction of a new nuclear power reactor and the rise in the resale value of existing nuclear power plants in the United States. The outlook for nuclear will become much clearer after 2010, when several nuclear reactors will be decommissioned, new technologies improved and overall economic costs readjusted, possibly downwards.

42. Over the longer term, nuclear power remains a potential alternative for electricity generation. However, the longer the current uncertainty persists, the more constrained will be the options and the less flexible and less diverse will be the power generating sector of the future. While nuclear power may not necessarily be a desirable option for each and every country, removal of that option for all countries as a group would remove an important element of flexibility and diversity in energy supply and, thereby, undermine energy security for all.

(E) Renewable Energy Sources

43. Political support for renewable energy is growing, with enhanced expectations that renewable energy sources are the panacea for the world's environmental problems. Ambitious programmes to significantly increase the market share of renewable energy, such as biomass, solar, wind, wave and geothermal, have been launched by the Commission of the European Union and many ECE countries. These programmes have successfully spurred on the development of new technologies, promoted their market penetration and increased their share of energy markets. For example, solar and wind technologies are being developed rapidly; large systems of wind turbines using second generation technology are being installed; wind power capacities are increasing by an average of 20 per cent annum; and photovoltaic sales by around 5 per cent annum since 1990.

44. But despite this encouraging outlook, renewable energy sources are not likely to contribute in a major way to meeting energy needs over the foreseeable future. While solar,

wind and biomass can be successfully deployed in specific areas under favourable conditions, their widespread use will continue to be restrained by economic factors and land and water surface constraints. Indeed, renewable energy costs have dropped dramatically over the past 10 years, but in most countries their costs are still not competitive with traditional energy sources for electricity generation.

45. Even the potential of hydroelectric power to contribute to increasing electricity demand is limited. The region as a whole is characterized by a state of maturing (or limits) when it comes to the development of hydroelectric power. Suitable sites are increasingly difficult to locate for hydrological reasons, competition with alternative land and water uses, and public resistance to the impact of hydro schemes on the natural environment.

46. The Russian Federation still possesses substantial untapped resources but these are in eastern Siberia and are unlikely to be developed very quickly because of their remoteness and low population density. Likewise, there is still considerable potential in a number of countries in central Asia but their development is hampered by the same constraints as those that apply to the development of oil and gas projects.

(F) Energy Mix

47. The energy security of countries can best be preserved by enhancing the diversity and variety of the mix of energy available to consumers. Over-reliance on one type or form of energy, particularly imported energy, can increase a country's vulnerability to unforeseen mishaps. A well-balanced fuel mix is the safest way for countries to ensure energy peace of mind.

48. Today, there are many forces at work, such as new technology, environmental concerns and financial constraints, which could limit and possibly even decrease, albeit very slowly, the diversity and variety of types of energy available in the marketplace. As discussed above, gas is today's fuel of choice. In a free market environment, gas is likely to make inroads and could gradually displace coal and nuclear power, and in time oil, in the marketplace. Likewise, renewable energies could prove uncompetitive in a totally free market environment. The concern is probably most pronounced in the power generation sector, where coal and nuclear are experiencing difficulties, notably for environmental and safety reasons. While these trends are not likely to alter significantly the energy mix in the short to medium term, they could over the longer term if present trends continue.

V. MARKET LIBERALIZATION

49. More than ever, governments today are not only preoccupied in ensuring that energy is available to their populations but that it is available to the economy at the lowest possible cost, and that it is used in the most efficient way possible.

50. It is commonly accepted that economic efficiency is best promoted through decentralized and liberalized energy markets, with freely determined market prices. In recent years,

technological, institutional and societal changes in many countries have tended to favour the implementation of measures in this regard.

51. It is important to recognize that the trend toward the restructuring and liberalization of markets and industries is not unique to the energy sector. It is part of a worldwide phenomenon favouring less government intervention in the marketplace. It involves the liberalization of markets, the privatisation of State-owned enterprises, and the globalisation or regionalisation of competition.

52. The trend to more open and liberalized energy markets is most pronounced in North America and western Europe. This trend will invariably spill over to the economies in transition in central Europe, particularly the EU Accession countries, where basic liberalization laws are likely to be adopted by 2005. Countries in eastern Europe and central Asia will also, with time, have to adapt their legislation and market structures to take account of developments in the rest of Europe.

53. The main objective for liberalizing energy markets is to promote increased economic efficiency in the marketplace. From a public policy point of view, it is important that resources are efficiently allocated in the economy, that consumers have as much choice as possible in terms of the different fuels and sources of supply, and that consumer prices are stable and “fair”, that is, free from undue market power. From the perspective of a supplier of energy, such as a private energy company, it is important that energy prices are sufficient to attract investment for the continued development of new supplies, and that the market penetration rates of the different fuels and supply sources are not hampered by artificial hindrances or barriers to entry.

54. To the extent that liberalization fosters or facilitates achievement of these objectives, it will also help to enhance energy security. However, the eventual implications of market liberalization on energy security are still uncertain and difficult to predict. Certain emerging trends are preoccupying or, at least, merit close monitoring.

55. Market liberalization is more likely to increase energy demand than to reduce it, contributing to higher cross border energy flows and, thus, to increased import dependence and the need for significant new investment in production and transportation infrastructure. Energy markets are far from textbook models of competition; there is no real atomistic competition; markets are not fully integrated; barriers to entry exist; there is a relatively high level of concentration and interlocking ownership; and therefore market liberalization is not likely to fully resolve these problems and may, in fact, exacerbate some of them.

56. Market liberalization is accelerating the race for greater size, and therefore the search by energy companies for partnerships, alliances, mergers, acquisitions and/or the creation of national champions. This consolidation trend is being reinforced by the convergence of the gas and electricity sectors, resulting in the emergence of multi-utility companies that, in some cases, are now also encompassing water activities. In this new competitive environment, the largest operators, capable of spreading risk over a vast and diversified market, seem to be gaining a competitive advantage.

57. Market liberalization is also entailing the reorganization of energy markets. New legal and regulatory mechanisms are being implemented, and the changing nature and character of the marketplace are compelling energy companies to rethink their corporate strategies, operating philosophies and lines of business.

58. In addition contractual arrangements between suppliers, transporters and consumers are being affected. Long- term take-or-pay contracts, the backbone of contractual arrangements for new supplies in some sectors, are being undermined. How this is likely to affect the development of new high cost sources of energy supplies and its implications for energy security is still uncertain.

59. Liberalization is indeed the best way to enhance economic efficiency and international competitiveness but it may not necessarily be the best way to promote energy security objectives. Therefore, complementary policy measures, that flank the marketplace, might have to be simultaneously pursued by governments.

VI. ACTS OF TERRORISM

60. Following the tragedy of 11 September 2001 in New York and Washington, the world entered into a new era of insecurity. The events of 11 September ushered in a new kind of international security risk; what used to be figments of an imaginative mind – the use of weapons by terrorists to cause mass destruction – became real and genuine.

61. The events of 11 September also raised a number of questions about the vulnerability of energy infrastructure to terrorist attack. Energy infrastructure is composed of primary energy-producing units that are connected to energy markets through a vast system of pipelines, road and water transportation, and electric power grids, including storage facilities. This complex, vast and expensive infrastructure is an appealing target for sabotage and acts of terrorism.

62. Even prior to 11 September, there were instances of acts of sabotage and terrorism on oil and gas pipelines and high-tension electricity transmission infrastructure. For the most part, however, these acts to further economic, political or ideological objectives were usually very localized and intended to disrupt the flow of energy and create economic hardship. But 11 September changed all of this. Today, one cannot dismiss the possibility of acts of terrorism on energy infrastructure aimed at generating the most extensive collateral damage possible, such as loss of life and mass destruction of property.

63. Large oil and gas production facilities (e.g., offshore platforms) and storage facilities (e.g., large liquefied natural gas storage tanks located in or near urban centres) have the greatest potential for creating collateral damage, though they may not necessarily be the most susceptible to attack. Likewise, attacks against thermal power plants and associated facilities, particularly in urban areas, can cause significant collateral damage.

64. On the other hand, oil and gas pipelines, and associated compressor stations, while more susceptible to sabotage and terrorism, are much less likely to cause widespread loss of life and property damage. Terrorist acts against these facilities, as well as electricity transmission infrastructure, can disrupt the availability and normal flow of energy, and if perpetrated against transportation hubs, can compromise the flexibility and integrity of transportation networks. But they are less likely to result in significant collateral damage and can be repaired relatively quickly.

65. There are a variety of risks associated with nuclear power ranging from theft, sabotage or illicit trafficking in nuclear material and other radioactive substances to sabotage or acts of terrorism against nuclear facilities or transport systems. There has been substantial international cooperation both to upgrade facilities around the world and to put more effective security recommendations and standards in place. Peaceful nuclear installations are often more robust and much better protected than other hazardous non-nuclear installations, but civilian nuclear facilities have normally not been constructed to withstand an attack such as the one that occurred on 11 September.

66. The security risks and consequences of attack by terrorists on energy installations need to be assessed and taken into account in energy policy decision-making. Facilities and hazardous materials need to be protected from mass-consequence sabotage or acts of terror. Adding to the woes of the energy sector are the difficulty and expense of obtaining insurance coverage against terrorism, exposing energy companies to potentially large financial risks. This also requires addressing.

67. But it should be stressed that while the potential for acts of terrorism are real and ever present, measures taken by governments and the private sector to protect energy infrastructure have to be commensurate with risks and potential damage. In the final analysis, these measures will invariably have to be paid for, and in most cases by energy consumers.

VII. CONCLUSIONS

68. Anxieties over energy availability and security of energy supplies, which abated in the 1980s and 1990s, have re-emerged. They are receiving increased public and policy attention. It would appear that the underlying long-run energy fundamentals that prevailed in the 1970s and early 1980s when energy supply and demand were tightly balanced and energy markets were rocked by two sharp oil price rises, have reappeared. Needless to say, energy markets today are indeed different from those that prevailed in the 1970s but recent energy market developments have pushed the issue of energy security higher onto the public and policy agenda.

69. Governments, the private sector and the general public cannot be complacent about energy security. Markets are changing and so is the political, economic and social complexion of the world. ECE countries need to renew their commitment to strengthen energy security by championing energy conservation and efficiency, expanding the fuel mix, diversifying sources of supply, including the development of indigenous supplies, building-up and maintaining strategic stocks as well as commercial stocks where warranted, and promoting research and development in

greening the fossil fuel energy-chain and in developing and commercialising new and renewable sources of energy.

70. The renewed attention and concern over energy security is already altering and influencing policy decisions in the ECE region on a number of important and thorny energy issues. Energy policies are being re-evaluated with respect to the future role of coal and nuclear power in meeting energy needs, the subsidization of indigenous energy production, the provision of incentives for the exploration and development of fossil fuels, the development of cleaner fossil fuels, and the commercialisation of renewable energy resources.

71. It is also important to emphasize that strengthening international relations and economic cooperation, reducing income disparities between and within countries, addressing the lack of economic development and the social, ethnic and political unrest in a number of ECE sub-regions can but help to promote energy security for all. Concerns about energy security cannot be totally separated from, and resolved without addressing, these broader issues and problems that besiege the region.