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Reports of regional preparatory meetings

Addendum

Report submitted by the Economic Commission for Europe*

* Report has been reproduced as received.

INTRODUCTION

1. The present report has been prepared pursuant to operative paragraph (f) of decision 7 (II) of the Preparatory Committee for the United Nations Conference on New and Renewable Sources of Energy in which it recommended "that the regional commissions should strengthen their participation in the preparatory process for the Conference, and, inter alia, assist and encourage in organizing national, regional and interregional seminars for detailed discussions, and that they should, under the over-all co-ordination of the Director-General for Development and International Economic Co-operation submit /inter alia/ regional papers ... in time for the third session of the Committee ...".

2. The information contained in this report has been drawn from the recent studies which have been undertaken by the ECE secretariat 1/ and from the results and conclusions of seminars and symposia convened on subjects relating to new and renewable sources of energy. These latter included the ECE Seminar on energy aspects of the forest industry; the Symposium on the prospects of hydro-electric schemes under the new energy situation; 2/ the Seminar on improved technologies for the extraction of primary forms of energy; 3/ the Seminar on co-operative technological forecasting: solar energy; 4/ and the Seminar on technologies related to new energy sources. 5/

I. MAIN TRENDS IN THE DEVELOPMENT OF NEW ENERGY SOURCES IN THE ECE REGION AND CONCLUSIONS OF ECE STUDIES

3. The assurance of an adequate supply of reasonably priced energy in the right place and form and at the right time is a prerequisite for social, economic and industrial development. This is true for the ECE region, but it is equally true, and is likely to become even more important, for the other regions of the world. This is confirmed by the significant increase in world energy consumption which has taken place in recent decades. For example, during the period since 1950, over-all energy consumption increased from 2.7 billion tons coal equivalent (tce) to 9 billion tce. However, up until the early 1970s, little difficulty was experienced in meeting this increased energy demand.

4. With the new energy situation which occurred in the early 1970s and, in particular, the sharp increase in the price of oil, a drastic change has taken place in the over-all world energy supply situation. In turn, this has caused unprecedented problems for developed and developing countries alike. It has also brought Governments to the realization that the development of adequate energy

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1/ See, inter alia, the report entitled "Energy reserves and supplies in the ECE region: present situation and perspectives" (E/ECE/984).

2/ EP/SEM.6/2.

3/ ECE/SEM.4/2.

4/ SC.TECH./SEM.6/2.

5/ SC.TECH./SEM.7/2 of which a limited number of copies will be available to delegations participating in the session.

supplies and resources is a problem of global concern which can only be solved through collective action by all Member States of the United Nations and, in particular, by the developed countries.

5. Part of the solution clearly lies in the development of much more diversified energy strategies which, on the one hand, exploit all energy sources both conventional and new and, on the other hand, ensure the rational application of advanced technologies and know-how in order to conserve scarce energy resources. Recognition of the "critical role which new and renewable sources of energy can play in increasing the industrial, technological, production and distribution capacities of developing countries as well as in enhancing research and development in this field", 6/ created the interest of member States in convening the United Nations Conference on New and Renewable Sources of Energy as a means of seeking a solution to some of the problems in the energy field.

6. Given the significance of the energy consumption of ECE member countries as a proportion of global energy consumption, and the important role to be played by the countries of the region in finding solutions to the world energy problem, it is not surprising to find that there has been a major increase in the level of energy related studies and research throughout the region. Within the ECE itself, almost half of the work of the Commission's some 400 projects relate to the energy field, and over 40 relate to new and renewable sources of energy. In the latest study undertaken by the ECE secretariat on "Energy problems and co-operation in the ECE region", the question of new and renewable sources of energy was specifically addressed, inter alia, by Governments in their response to a questionnaire.

7. Based on the preliminary findings of the above-mentioned study, it would appear that Governments expect an accelerated growth in energy demand in comparison with the period 1973 to 1978; they also expect energy economy and efficiency to improve but only at sharply reduced rates; the rate of growth of production from indigenous sources to decline; imports of coal and gas to increase for most countries; and oil import demand to remain at high levels. With regard to new and renewable sources of energy it is not expected that these will make a substantial contribution to energy supplies.

8. During the 1980s, ECE Governments generally intend to restructure their productive infrastructure in favour of the "long reserve" fuels - coal and nuclear power - in order to compensate for the lower growth potential of indigenous oil, gas, hydropower, and new sources. In quantitative terms, coal is expected to become the most important form of energy produced in the ECE region by 1990; nuclear power is also expected to grow rapidly supplying, in 1990, 21 per cent of electricity.

9. It is expected that most public expenditures on energy R and D will continue to be allocated to long-established projects in nuclear power (the fuel cycle, safety, breeders, fusion) and conventional forms of energy (conversion, combustion,

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6/ General Assembly resolution 34/190.

limitation of environmental damage). It is also expected that growing attention will be paid to energy conservation and to new sources of energy - in particular, hydropower, solar, geothermal, biomass, and wind.

10. Several ECE Governments have set goals for the possible or desirable contribution which new and renewable sources of energy could make by the year 2000. The United States President has set a goal of deriving 20 per cent of energy needs from the sun; the Netherlands expect a contribution of solar/wind/waste energy of 1.6-3.2 million tce; Norway expects the supply of 4 TWh from wind and ocean wave energy, solar heat and biomass; Iceland assesses the potential supply from biomass at 15 per cent of total energy requirements. In Canada, biomass is expected to supply 7 per cent of energy needs by 1985. Biomass would add the equivalent of 2 million tce to energy supplies in Turkey.

11. Over the next decade - and for the region as a whole - energy sources other than coal, gas, oil, hydro and nuclear power are expected to add about 81 million tce to energy supplies (see table I).

12. The conclusions of the recent ECE Seminar on Technologies related to New Energy Sources, which focussed on solar, wind, and geothermal energy, indicate that although the industrial use of renewable energy sources is still at a relatively early stage of development, based on current technologies and R and D under way, it is evident that, during the next 20 years, there will be a real potential for the increased utilization of solar and geothermal energy for hot-water supplies, heating, drying, air conditioning, and desalination, and for limited localized applications of wind energy.

13. The conclusions of the Seminar also indicate that, in general, ECE member Governments do not consider that these energy sources will provide a substantial substitute for oil, gas, coal or nuclear power in the near and medium-term.

II. FUELWOOD AND OTHER FOREST BIOMASS

Present situation

14. For millions of years, wood was man's principal fuel. It lost this position between the seventeenth and nineteenth centuries in the countries which now make up the ECE region, but in many parts of the world wood remains a fuel of literally vital importance. The FAO estimates that, at present, 2,000 million people (half of the world's population) depend on wood or charcoal for their basic energy needs of cooking and heating.

15. In the ECE region at present, wood is used as a source of energy by two main groups:

- rural households, essentially for heating. These people may buy fuelwood, or harvest it themselves, on their own or commercial land;

- forest industries, who use their own residues to satisfy part, or all, of their energy needs.

Wood used for energy in the late 1970s

(estimates)

	Wood used as a source of energy (million m3)	Energy equivalent (1,000 TJ)	Percentage of final energy consumption
Europe	97	723	1.5
USSR	108	812	2.1
North America	142	1,064	1.7
ECE region	348	2,600	1.7

16. At the present time, nearly 30 per cent of the wood harvested in the region was used as a source of energy. Energy therefore remains one of the principal end-uses for wood. Although at the regional level wood accounted for only 1-2 per cent of total final energy consumption, in some countries the proportion is much higher. Examples in the ECE region are Turkey, where the share of wood-derived energy is estimated at 23 per cent; Sweden 8 per cent; Finland 7 per cent; and Yugoslavia 4 per cent. In developing countries outside the region, of course, the proportion is much higher.

Trends and prospects

17. The use of wood for energy declined steadily until the 1973-1974 "oil shock" raised prices of other forms of energy and awoke doubts about the security of the energy supply. As a result:

- individuals with access to wood supplies and to wood-burning equipment have started to burn wood (or more wood than previously) as a source of heat. The sharp increase in demand has caused a correspondingly sharp increase in price;

- Governments with significant forest resources have started to examine the potential to increase energy supply from the forest, both as conventional fuelwood and as feedstock for the manufacture of synthetic fuels, notably methanol and ethanol. Large research projects have been undertaken on the technology and economics of production, harvesting and conversion of biomass. As yet, there is no significant commercial production of synthetic fuels from wood. One idea which has attracted considerable attention is the establishment of "energy plantations" for intensive cultivation of fast-growing species for the production of energy.

18. It is beyond the scope of the present report to analyse in detail the potential of these new forms of biomass energy which will depend, like all other new forms of energy, on technological developments, economics, relative costs, availability of resources (in this case, forests and suitable land for energy plantations), etc.

19. It is worth pointing out, however, that unlike most other forms of energy dealt with by the Conference, wood-derived energy is at present in use. Moreover, this expansion is taking place spontaneously, without government encouragement, in the ECE region.

20. It should also be borne in mind that there are other uses for wood as raw material for the forest industries. Already some sectors - such as the particle board industry which has tended to use cheap, low-quality raw material - have been affected by the rise in fuelwood prices. Some wood has already been diverted to the fuelwood market. This interaction between the expanding use of forest biomass for energy and the raw material needs of the forest industries must be examined closely before plans to expand biomass energy are put in hand.

III. GEOTHERMAL

21. In the ECE region, geothermal reserves exist in the form of steam fields and very high temperature water which occur in the United States, Italy, and Iceland and which typically extend along tectonic ridges such as those in the Mediterranean region and the low temperature deposits which are common in several ECE member countries in Europe. Potential also exists for the development of technologies for the extraction of heat from hot dry rock.

22. Although the first application of geothermal energy was in 1904 in Italy for the production of electricity, it was not until the mid-1950s and early 1960s that any extensive exploration and development work took place. Following the energy crisis in the early 1970s, exploration for, and the development of, geothermal deposits was further intensified in many countires of the region for domestic hot water, space heating and the production of electricity.

23. The conclusions reached at the ECE Seminar on Technologies related to New Energy Sources indicate that technical and economic considerations are important factors in evaluating and developing geothermal resources. A significant part of the total expenditures associated with the development of geothermal resources is devoted to the costs of exploration, and especially drilling. "The basic principle of depth drilling is finding the optimum balance between the temperature increase, which is linear, and the well depth cost of drilling, which grows exponentially. The optimum is often found at a depth lower than 3 km." 7/ Many of the exploration and drilling techniques used are based on those developed for oil and gas exploration and, in fact, much useful information has been gained concerning temperature gradients and geothermal resources as part of earlier oil and gas exploration work.

24. Many of the most valuable geothermal resources, which also contain low levels of dissolved water, are near the surface - such as the geothermal resources in the Pannonian Basin - and, as such, are economic targets for exploitation. These low- to medium-temperature geothermal deposits can be used for both communal heating in

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7/ "Energy reserves and supplies in the ECE region" (E/ECE/984).

industry and agriculture as well as for hot water. Deposits of this kind with a temperature range of 40° to 100°C are widespread in Europe and no particular problems appear to exist in the exploration for, and development of, these deposits. Accelerated development of these kinds of geothermal resources could also help replace heating oil or gas - the energy forms most frequently used for these applications.

25. Regarding the use of geothermal resources for electricity production, it is considered that this will be a fruitful area for future development. However, since there are relatively few steam fields and very hot pressurized water deposits in ECE member countries, the most promising developments are likely to be based on technologies for the extraction of thermal heat from hot dry rocks. However, given the present level of know-how and research in this field, it is not expected that the exploitation of hot dry rock techniques will be economic in the short-term.

26. In those countries with experience in the development of geothermal deposits - such as France, Hungary, Iceland, Italy, and the United States - the unit price of geothermal energy for non-electrical use is less than that of other energy resources. As further price increases occur for fossil fuels - in particular, oil - the use of geothermal resources is likely to become even more attractive.

IV. HYDROPOWER 8/

27. The 1976 World Energy Conference "Survey of Energy Resources", indicated that there is a total hydropower potential of 2.2 million megawatts of installed and installable generating capacity with a potential annual energy production of 9.7 million megawatt hours, of which the ECE member countries have about 22.5 per cent. In terms of unexploited potential in the region, only the USSR disposes of a great, but as yet unexploited, hydropower potential. This amounts to some 88 per cent of the economically recoverable hydropower potential in the country.

28. The competitive advantage of hydropower stations is at present improving as the costs of fossil fuels for heat/power generation are increasing and as, in the long term, limitations of supply become apparent.

29. Hydropower plants now considered viable cost between 800 and 1,500 $/kW. On certain assumptions (a capacity factor of 0.53, assumed costs of oil at the time of completion of the plant of 20 $/bbl, an increase of these costs by 5 per cent a year during the 35-year lifetime of the plant, an interest rate of 8 per cent), investments of up to 3,400 $/kW for a hydro-plant would be justified. Assuming that the price of oil remains unchanged at 20 $/bbl, the break-even point would be at 1,700 $/kW.

8/ The information contained in this section of the report is drawn from Chapter IV of the ECE publication entitled "Energy reserves and supplies in the ECE region" (E/ECE/984).

30. Hydro-plants compare favourably with nuclear plants - also a capital-intensive option - although the advantage is smaller, depending on the capacity. Current estimates of the cost of the nuclear kW(e) oscillate between $3,000 and $5,000 whereas the hydro kW(e) ranges between $800 and $1,500 (1976 dollar values).

31. Obviously, there are many other factors that must be included in the assessment of particular cases. However, the basic facts outlined above lead to the conclusion that increased investments for hydroelectric plants are economically justified. So, more sites are becoming viable as is the up-grading or rebuilding of existing plants. A re-evaluation of former studies appears to be of great importance.

32. Whereas nearly all other energy sources aim at generating power as their sole purpose, hydraulic resources must often also be used to provide navigation, flood control, irrigation, public water supply and recreation. So planning for an installation is usually complex because many factors are involved. The present tendency is to develop plans for an entire river basin so that the best over-all use of the water resources can be achieved. Individual projects are considered today not as an isolated activity but as a part of a regional, national and occasionally international effort - particularly when a river crosses more than one country.

33. Considering that nuclear and larger thermal power stations will cover the base part of the electricity load curve, the peak demand which actually grows at a higher rate might best be covered by hydro-stations. Pumped storage and mixed gravity-pumping schemes appear as the necessary complement of modern electricity generating systems. Such schemes would absorb the surplus of energy produced by the nuclear and thermal plants during the daily and weekend lows whilst meeting peak demand.

34. The construction plans of new generating capacities show the growing recognition of this specific characteristic of hydro-installations. In the European Economic Community (EEC) new conventional hydro-plants represent only about 1 per cent (1,204 MW) of the total new electric power capacity which will be installed between 1977 and 1982, while pumped storage stations and mixed gravity-pumping schemes will represent about 8 per cent (7,699 MW). In the United States a long-term study of the role of hydroelectricity suggests that pumped storage projects under construction or planned would during the 1980s at least double the current hydro-installations dedicated to peak demand coverage.

35. These considerations show that extensive hydroelectric development is likely to occur during the coming decades. Its role and importance are growing and will become even more essential. If sites are available hydroelectric energy appears to be the most economical and feasible of the renewable sources of electric power, so efforts to develop additional production will increase.

36. During the period from 1950 to 1965 the world growth of hydroelectric production was 6.8 per cent per year (6.3 per cent for the ECE region) and for the decade 1965 to 1975 the rate has been 4.8 per cent (4.1 for the ECE region). In North America the growth rate has been fairly uniform during the last 25 years at about 4.9 per cent, whereas in western Europe the rate was 6.8 per cent between

1950 and 1965 and decreased to approximately 3.0 per cent between 1965 and 1975. In eastern Europe it decreased from 12.7 per cent to 4.8 per cent for the same periods mentioned above.

37. Assuming suitable financing arrangements can be made - and this will be a problem for some countries in the region and certainly for the developing countries outside ECE - it seems reasonable to expect that the installations under construction reported in 1976 will be completed by 1985. Further planned installations will be completed by 1990. Based on available data, it is expected that between 1975 and 1990, there would be an increase in the installed hydro-capacity in the ECE region of about 75 per cent, or of 3.7 per cent annually. In western Europe hydropower would grow by 2.8 per cent, in eastern Europe by 6.4 per cent, in North America by approximately 3.5 per cent, and for the world by about 4 per cent.

V. SOLAR

38. Although the use of solar energy is expected to become widespread in the ECE region by the year 2000, it does not appear that its share in the national energy balance of most countries will exceed 1 or 2 per cent. Current R and D work on the conversion of solar energy is concentrated on a wide range of technologies which are at varying stages of development. These include those related to low- and medium-temperature heating and cooling, solar thermal, direct conversion to electricity, and chemical or biological conversion.

39. At the present time, the technologies related to low- and medium-temperature heat generation and cooling appear to be at the most advanced stage of development. Current application of these technologies include processes for the production of hot water, space heating, drying, distillation and air conditioning. Regarding the production of low- and medium-temperature heat, it appears that the flat plate collector, which is already available in most ECE member countries, coupled with the use of a back-up conventional energy source is the most economically viable technology at the moment.

40. The price of the flat plate collector represents about one-third of the price of a solar water-heating facility, the storage and the heat exchanger about one-half, and plumbing and installation costs the remainder. Usual pay-back times (at current energy prices) range from five to more than ten years and depend on the location of the facility and the level of insolation. In most ECE member countries, solar water heaters are manufactured in optimized, integrated modules comprising all the components of the system.

41. Regarding the development of photovoltaic and thermo-electric converters, considerable progress has been made in recent years in ECE member countries, but the cost per unit of installed capacity makes them unacceptable at the moment (at current energy prices) for large-scale electric power plants. In addition, like all solar energy applications, solar cells require either a storage mechanism - usually batteries - or their integration into a composite system involving other sources of electricity and this tends to increase over-all system costs further. However, it is generally agreed that the costs of manufacturing solar cells are

expected to decrease significantly by the year 2000 which will also mean that the direct conversion of solar energy into electricity will become economic by the end of the century. Notwithstanding the fact that the application of photovoltaic cells is not economically attractive at the present time, considerable interest exists in their use in remote areas which are not linked to existing power networks. These include, for example, applications in lighthouses, beacons, radio transmitting and relay stations, and electrical devices for the protection of drilling rigs, as well as gas and oil pipelines, etc.

42. Considerable research and development work is also being devoted to large solar thermal power plants and a few experimental plants are at present under construction. Studies are also focusing on the economics of thermal power plants since the costs of the research associated with their development and the capital costs of construction are expected to be high. At the present time it appears that solar thermal power plants will only become economically viable in the long-term.

43. Another promising area for research is related to the chemical and biological conversion of solar energy which may prove particularly valuable for the production of hydrogen and for energy storage. However, work in this area is still, for the most part, at the stage of basic research.

VI. WIND

44. Although considerable interest exists in ECE member countries in the development of wind energy, only a few countries expect that it will contribute more than a few percentage points of their future energy needs by the year 2000. The main reason for this is that there is a need for a very considerable amount of research, technical development and industrial effort before any large-scale construction of wind turbines can be expected. However, given the potential which exists for the use of wind energy, it is felt that vigorous development work in this field is justified.

45. Current R and D in the field of wind energy is being concentrated on a wide range of technical problems relating to both horizontal and vertical axis wind turbines, concentrating devices, and evaluation of operation and maintenance characteristics.

46. Several ECE member countries foresee useful applications for small wind power units for electricity generation for use in agriculture, irrigation, desalination, aeration, and anti-corrosion measures. Such small-scale wind turbines are expected to play a particularly valuable role in remote areas and isolated rural communities. However, if they are to be economic, there will be a need for them to be relatively maintenance-free and allow for remote operation. A very important aspect of such systems is that they could be extremely useful for third world countries, if correct ways can be found to transfer the experience obtained. Technical maturity and economic feasibility for these wind turbines is expected to be achieved within approximately five years.

47. Regarding the large-scale wind turbines, several ECE member countries are undertaking research on large wind power units with a nominal capacity in the

2-5 megawatt range. Simultaneously with design and construction of such plants, investigations are being undertaken using simulations to determine the potential contribution which might be made by such wind turbines in the energy balance of these countries. Studies are also under way on problems relating to the integration of the energy derived from large wind turbines into existing power systems. The integration problems require that, at an early stage, thought be given to the planning of high-capacity storage systems. In order to be economically feasible, such storage systems must not be devoted purely to wind energy. For the purpose of "peak-sharing" associated with conventional power plants, storage systems are already economic and allow the accommodation of a high percentage of energy produced from fluctuating sources.

48. For many ECE countries, the location of wind power plants poses complex problems and, for this reason, the possibilities of locating wind power plants off-shore is under active consideration. This alternative could have many advantages: off-shore wind power stations occupy no land area, local disturbances or risks to third parties in connexion with operation of the stations are eliminated and wind conditions off-shore are usually more favourable than on land. However, the problems of icing, waves, corrosion, and maintenance place more exacting requirements on structural material and design. Another disadvantage is that submarine cables linking the units to land are expected to be expensive.

49. The widespread introduction of wind energy systems in the near future will require that research be concentrated in the areas of aerodynamics, aeroelastics, fatigue-resistance, and failsafe structures for rotor blades. Permanent research and advisory centres are needed to build up and maintain expertise in these rather specialized technical fields, which can be used by industry, governments, and third world countries. Sharing of expertise and national research centres could accelerate research and development work in this field and could reduce costs, in particular for developing countries.

VII. CONCLUSIONS

50. As indicated earlier in this report, the energy economy provides the most important basis for economic development, technical advance and improvements in living conditions. However, to date, it is very largely the developed countries which have benefited from this and been the major energy consumers. If the gap between the industrialized and developing countries is to be bridged, world energy consumption can be expected to increase significantly. If certain assumptions are made concerning population increases in developing countries and if reasonable economic growth rates are achieved of not less than 3-4 per cent, it is reasonable to expect the doubling of world energy consumption by the year 2000 - from the present some 9 billion tce to 18-20 billion tce. However, as can be seen from the information contained in table II, the share in the energy consumption of the developing countries will rise significantly from the present some 20 per cent to nearly 50 per cent by the year 2025.

51. As regards energy supplies, recent studies indicate that, on the whole, world energy supplies can match energy demand. However, individual regions

will face specific difficulties in satisfying their demand especially during the next 20 years. This is particularly the case for the developing countries which have limited availability of domestic energy resources. In this context, it has been estimated that by the end of the next century, cumulative coal consumption will exceed known economically-recoverable coal resources in the developing countries by more than seven times. Oil production (for domestic consumption and export) exceeds recoverable resources of traditional oil. The same situation arises with regard to natural gas. Nuclear resources - even if a "minimum-case scenario" is accepted - will be almost completely used up. A "maximum-case scenario" indicates that the deficit of uranium amounts to more than 60 per cent of regional known resources.

52. According to current geological estimates (though incomplete and not verified), developing countries do not at present possess enough fossil-fuel resources to ensure their development towards the end of the next century. These resources amount to not more than 2,000 billion tce of which coal accounts for 81 per cent, oil 13 per cent, and natural gas 7 per cent. Known fossil resources can satisfy only 30-50 per cent of future integral demand of developing countries.

53. According to very approximate estimates, utilization of renewable resources (solar, wind, hydro, etc.) may provide only 15-20 per cent of energy supplies in developing countries. These will amount to 8-10 billion tce per year by the end of the next century, i.e. equivalent to covering 425-450 billion tce of the total cumulative demand.

54. The remaining part of the total cumulative demand, which amounts to some 2,000 billion tce (maximum case) or 1,000 billion tce (minimum case), may be covered in practice only by nuclear energy.

55. Although the contribution which new and renewable sources of energy can be expected to play in meeting over-all energy demand may only be modest up to the year 2025 - 6-7 per cent in the case of developed countries and 15-20 per cent for the developing countries, when viewed in absolute terms it is sufficiently large to justify concerted world action. Furthermore, given the long-term difficulties which developing countries will have to face in meeting their energy demands, the problem is rapidly becoming of major international concern - one which might reach crisis proportions during the twenty-first century if organizational, political, and economic measures are not taken in due time.

56. In one of the Notes by the secretariat prepared for the ECE Seminar on Technologies related to New Energy Sources, it was suggested that the following might be among some of the technical measures which should be taken:

"(a) intensification of geological research and exploration works with a view to discovering new deposits of fossil fuels and uranium in developing countries;

(b) development of R and D in the field of the potential and the economics of efficient use of renewable energy resources;

(c) orientation towards construction of simple and cheap energy-producing installations which would make it possible to introduce renewable energy resources into national economies in a short time and on a relatively wide scale for energy supplies to widely-dispersed consumers, as well as orientation towards the most up-to-date units (nuclear energy) used in highly industrialized countries for the purpose of providing energy supplies in areas with a high concentration of energy consumption;

(d) selection and training of highly-qualified national specialists capable of solving future energy problems arising in the twenty-first century; and

(e) introduction of national planning systems and orientation in their work towards the most economical technological processes from the point of view of energy conservation."

(SC.TECH./SEM.7/R.4)

57. The kinds of measures referred to above and those which will result from the forthcoming United Nations Conference will require that efforts be exerted in the developing as well as in the developed countries and by the international community.

58. One of the recommendations made by the ECE Seminar on Technologies related to New Energy Sources was the creation of a Working Party on New Energy Sources within the framework of the Economic Commission for Europe. Although this recommendation has yet to be considered by the Senior Advisers to ECE Governments on Science and Technology at their ninth session in June 1981, such a working party, if established, might well serve as an effective instrument both to serve the interests of ECE member Governments and to assist in the follow-up of the Conference.

TABLE I

Primary energy production resulting from new and renewable sources of energy other than hydropower

(million tons coal equivalent)

	1978	1985	1990	2000
Western Europe	0.21	4.97	14.31	41.23
Eastern Europe (excluding USSR)	0.19	1.38	4.40	6.46
USSR	61.10 (largely wood)	49.23	49.30	70.30
North America	6.50	9.38	12.72	40.27
Total ECE	68	65	81	158

Source: Senior Advisers to ECE Governments on Energy, Energy Data Bank, Geneva, October 1980. Forecasts made by Governments and estimations.

TABLE II

Projections for regional energy demand

(billion tce)

	1975	2000	2025	END OF TWENTY-FIRST CENTURY
TOTAL	8.95	18	30	65
INDUSTRIALIZED COUNTRIES	7.25	12.8	16.5	19.5
DEVELOPING COUNTRIES (minimum case)	1.70	5.2	13.5	45.5
