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INVESTMENTS ISSUES IN THE ELECTRICITY SECTOR OF THE ECONOMIES IN TRANSITION IN THE UNECE REGION

(Prepared by László Molnár*)

I. INTRODUCTION

1. This paper has been prepared as a background document for both the sixth session of the Ad Hoc Group of Experts on Electric Power and the Roundtable on "Facilitating Investment in the Electricity Sector in the Transition Economies" being jointly organised by the Committee on Sustainable Energy and the Ad Hoc Group of Experts on Electric Power in Geneva on 19 November 2003.

2. It should be noted that this paper focuses on the generation and transmission sectors and only touches in a limited way on the problems faced by the distribution sector.

3. It is intended that the paper provide the basis for discussion and hence it not only raises questions, but also offers a number of answers with regard to the investment problems currently affecting the electricity sector in the economies in transition.

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II. BACKGROUND

4. A number of UNECE economies in transition are facing a range of specific investment problems, with a lack of investment currently noted in the electricity generating sector. It has been estimated that some US$ 10 billion investment is needed by this sector by 2012, in particular for rehabilitation of existing power plants. If this investment is not forthcoming over this period then the regulated electricity market could be jeopardised. However, investment is clearly an issue for the UNECE region as a whole and not just the transition economies, as witnessed by the recent power failure in eastern Canada and the north-eastern part of the United States of America. Looking out to 2030 for the entire European electricity market, the International Energy Agency (IEA) estimates that, to meet growing electricity demand, the EU-15 will require some US$ 1,100 billion of investment and the rest of Europe some US$ 250 billion.

III. CURRENT SITUATION IN THE ELECTRICITY SECTOR IN THE TRANSITION ECONOMIES

5. In order to gain a better understanding of the investment problems in the region a brief description of both the economic situation and the energy sector is provided. The UNECE transition economies have undergone a great many changes since 1989-90. Almost all have become an operating market economy with a multi-party system. Private capital is prevailing. Ten of these economies will become members of the European Union (EU) in 2004; others are likely to become members in the foreseeable future. In recent years a special economic relationship has developed in the area of energy between Western Europe and Russia, together with a number of other energy producing states of the Former Soviet Union (FSU).

6. However, there are still large economic differences. The unification of an economically divided Europe is an important task to be undertaken in the near future.

7. If the economic indicators of countries in the Western and Eastern spheres of Europe are analysed, Europe can be seen to be divided into two parts, as shown by the following comparison.

8. Compared to OECD-Europe, in the Central and Eastern European transition economies the following holds true:

(i) GDP/capita values are *relatively* low. If adjusted by the purchasing power parity (PPP) GDP looks more favourable. The *relatively* low GDP is a result of several factors, among them distorted industry structure (too much heavy industry, low share of "high-tech" industries), poorly developed services, low level of employment, inadequate economic efficiency;
(ii) The share of energy intensive (heavy) industries is *relatively* high;
(iii) Energy intensity is *relatively* high i.e. 2-3-4 times more energy is required to produce one unit of GDP than in the Western countries. This figure becomes more favourable if the intensity is adjusted by PPP. At the same time energy use per capita is generally lower in transition economies than in the EU (see Table 1);
(iv) Energy efficiency is *relatively* low (e.g. heating or generation specific values are much higher);
(v) Emission values (CO_2/GDP) are *relatively* high, and
(vi) Energy prices are *relatively* low (or very low in the case of households).

9. There are also marked differences among the Central and Eastern European countries as highlighted in Table 1.

Table 1: Energy Intensity[a] and Specific Energy Consumption in Selected Countries

Country (2001 data)	GDP per Capita[b] (000 95 US$/capita)	Energy Intensity (toe/000 95 US$)	Energy Intensity PPP adjusted (toe/000 95 US$)	Energy Use per Capita (toe/capita)
Czech Republic	**5,31**	**0,74**	**0,30**	**3,93**
Poland	**4,23**	**0,55**	**0,26**	**2,33**
Hungary	**5,40**	**0,46**	**0,22**	**2,47**
Russia Federation	**2,45**	**1,72**	**0,55**	**4,22**
Austria	**32,92**	**0,11**	**0,15**	**3,52**
Germany[c]	**32,69**	**0,13**	**0,18**	**4,13**
Portugal	**12,92**	**0,19**	**0,15**	**2,46**

[a] Energy intensity = total energy use / GDP (in this instance the energy required to produce 1,000 US$ in tonnes of oil equivalent (toe))
[b] Nominal GDP. If adjusted by PPP the difference is reduced 2-3 times
[c] Approximately represents the EU average

IV. PARTICULARITIES OF THE ENERGY SECTOR IN THE ECONOMIES IN TRANSITION

10. Central-Eastern European (CEE) transition economies are markedly different from other developing countries from the energy point of view. In general these countries share the following characteristics:

(i) A well-developed energy sector with high capacity reserves.

(ii) The electricity coverage is very high (usually 99 % of the households are connected to the grid).

(iii) Nuclear energy represents a high percentage of the total energy mix.

(iv) Availability of a high number of well-qualified and competent energy experts.

(v) Many of the countries are net exporters of electricity.

(vi) Due to the collapse of heavy industry after the transition period commenced, the primary energy as well as the electricity demand in many of these countries is about the same or less than it was 15 years ago. There is often excess capacity.

11. However, the CEE transition economies also share a number of negative aspects:

(i) Their electricity systems are often very old, obsolete and operate at low efficiency levels. Therefore even in the case of stable demand, a high level of replacement and modernisation investment is necessary.

(ii) Energy tariffs and prices are often very low (in particular for households), reflecting only 10-90 % of the long run marginal costs.

(iii) Metering and billing are often missing, the rate of payment of electricity bills is low to very low (up to 90 %) in some countries, and in one or two cases there is the occurrence of the theft of electricity.

(iv) There are many subsidies and cross-subsidies, mainly for household energies (electricity and gas).

(v) As a consequence of the previous points the majority of the energy companies are unprofitable, the energy infrastructure is in a poor condition and the companies are experiencing difficulties in carrying out the necessary maintenance and development.

(vi) It needs to be emphasised, however, that huge differences exist among CEE transition economies with regard to the status and operation of their electricity sectors.

12. At this point it is useful to pose a number of questions:

(i) Why do many CEE governments think that the energy sector is a strategic branch and that it should be kept state-owned forever? (Data deriving from the OECD show that the whole energy sector's contribution (value-added) to the national GDP is not more than 2-5 % - and is shrinking. Compared to the tertiary sector's contribution (50-70 %) it does not seem to be very high. However, it needs to be mentioned that in one or two countries (e.g. Russia) the oil and upstream gas industry is very important. The strategic importance of the energy sector is a result of the fact that the operation of all sectors may be blocked by the shortage of electricity and/or gas.)

(ii) Why do many CEE governments resist privatisation insisting that the state is the best owner? (The long history of the centrally planned economies proves just the opposite.)

(iii) Why do many CEE governments think that they have to show their "social sensitivity" by keeping household energy prices low? Why should e.g. household gas prices so frequently be an election issue? (Analyses of major think tanks prove that distorted energy prices lead to low economic efficiency, loss of GDP (i.e. decrease of GDP) and a wastage of energy. This type of "social sensitivity" proves to be a hindrance to both economic and social development [welfare] and also damages the environment.)

V. CURRENT DEVELOPMENTS IN CEE TRANSITION ECONOMIES

13. The electricity sectors of almost all the CEE economies in transition share a number of characteristics:

(i) Basic data of the 10 EU candidate countries: 140 million inhabitants, 110 TW power generation capacity, producing 625 TWh per annum.

(ii) There is a limited level of privatisation (from formal privatisation – where in the background the state is the real owner – to foreign professional or financial investors).

(iii) The "unbundling" of the large monopolistic state-owned electricity utilities has in many cases happened, but it is often only an administrative/financial separation of the different units (supply-transmission-distribution-Transmission System Operator (TSO)).

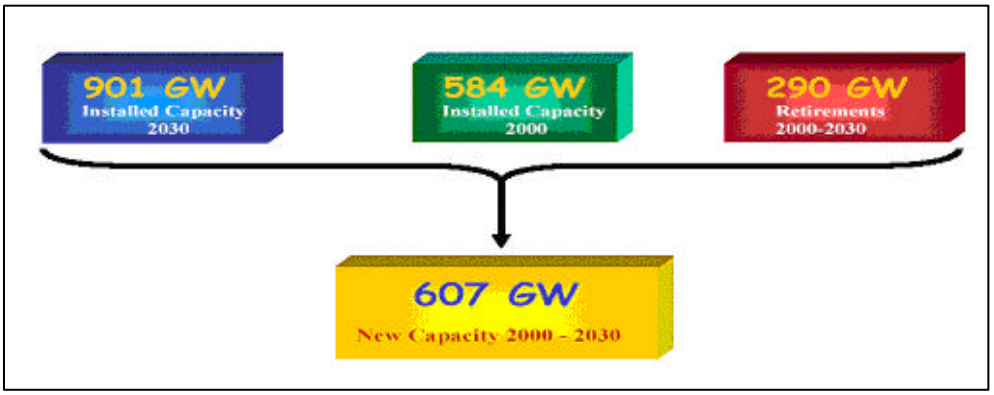
(iv) Liberalisation has commenced almost everywhere, but in most instances only a relatively small share of the market is actually open. For the main part only large industrial customers may enter the liberalised market, with households not yet eligible.

(v) For the 10 EU candidate countries, EU directives related to the power sector are increasingly beginning to dominate energy policy.

VI. WHY IS IT NECESSARY TO INVEST IN THE ELECTRICITY SECTOR OF THE ECONOMIES IN TRANSITION?

14. According to an International Energy Agency (IEA) study, electricity demand in the EU-15 is forecast to grow rapidly (see Graph 1). Capacity additions over the next 30 years will be larger that today's installed capacity. In the EU looking out to 2030, some 607 GW of new capacity is needed requiring investment of more than US$ 1100 billion. The "rest of Europe" needs US$ 250 billion investment (see Graph 2).

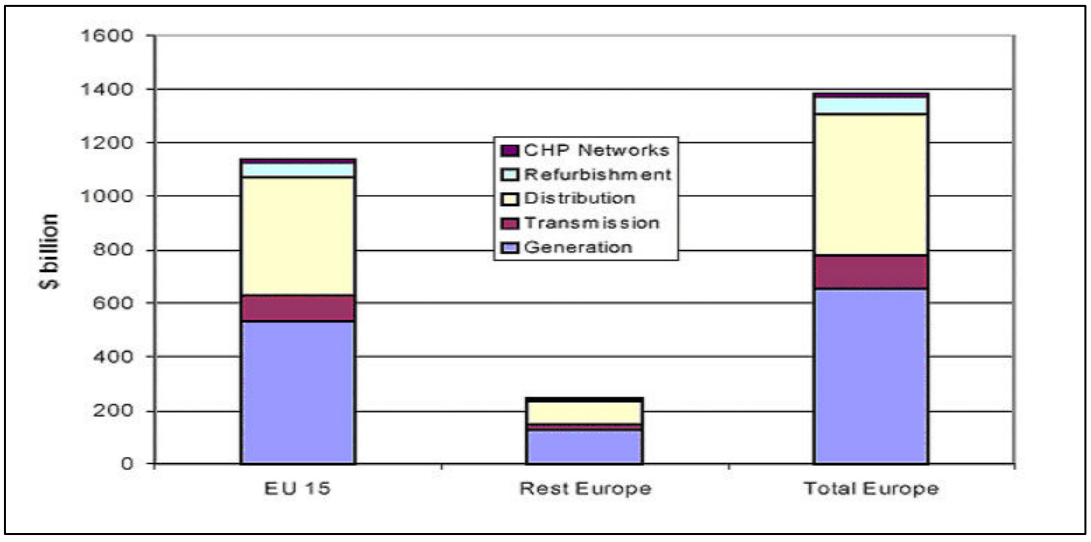
Graph 1: Installed capacity in EU-15



Source: IEA

15. The IEA estimates that cumulative investments of US$1.4 trillion will be needed, less than half of which will be for additions to generation capacity (Graph 2).

Graph 2: Investment Requirements in the European Electricity Market to 2030



Source: IEA

16. It is interesting to note from Graph 2 that as much investment is needed for distribution as for generation.

17. Projections from studies by both the IEA and the US Department of Energy (DOE) Energy Information Administration (EIA) show that electricity demand is growing rapidly and therefore an appropriate solution is needed in order to balance generation capacity with demand.

18. Over the IEA's projection period to 2030, electricity is forecast to grow faster globally than any other end-use source of energy, that is by 2.4% per year. World electricity demand will double through 2030, while its share of total final energy consumption will rise from 18 % in 2000 to 22 % in 2030. The biggest increase in demand will come from countries with developing economies. Electricity use is predicted to increase most rapidly in the residential sector, especially in countries with emerging economies. However, the huge difference in per capita electricity consumption between the OECD and these countries with developing economies will hardly change over the projection period.

VII. VIEWS AND ANALYSES OF PROBLEMS IN THE INVESTMENT PERFORMANCE OF ELECTRICITY MARKETS

19. This section highlights the general investment problems in CEE transition economies. There are a number of specific investment problems in more than one of these economies, with many of the problems related to the fact that they are still undergoing the transition from a centrally planned economy to a fully functioning market economy. An overview of the problems being encountered is provided below; however, it should be emphasised that these problems are becoming less significant:

(i) Political instability, although the trend for this is declining, and also risks (such as discrimination, transfer restrictions, breach of individual investment contracts, expropriation and losses resulting from strife).

(ii) Absence of a sound and stable economic/financial policy and/or energy policy, with constantly fluctuating local currency / US$ or € exchange rates.

(iii) The local legal system (investors would prefer to have access to an international legal system), the legal environment often changes rapidly, sluggish operation of the local courts, frequent arbitrary and non-uniform enforcement of existing laws.

(iv) Complicated bureaucratic system, sometimes corruption and occasionally absence of any clear regulation.

(v) Slow licensing procedures.

(vi) Rarely, but sometimes: populist or nationalist economic policy, unfounded preconceptions, criticism against foreign investors, use of scapegoats and absence of a non-discriminatory approach.

(vii) No (long-run marginal) cost-reflective electricity prices, often combined with an unfair return on investment and cross-subsidization.

(viii) Lack of expertise in the knowledge of the market economy.

(ix) Rapidly changing economic and regulation environment (liberalisation commencing, setting up of new regulatory bodies, new pricing processes being introduced, on-going privatisation and/or unbundling and changing of ownership).

(x) Lack of "local" capital.

Items (i) to (x) could be viewed as controversial and hence could be topics for debate.

20. It is clear that the investment framework changes radically as a result of market reforms. The reform of the electricity supply industry has profound implications for investment decisions. In the traditional approach to regulation, in which government entities have a direct role in investment, priority is often given to ensuring that there is enough capacity to cover demand for power at all times.

21. Costs are also a consideration, but only to the extent that the ability to meet demand is not compromised. In this context, over the last 20 or 30 years, the electricity systems of most OECD countries as well as the centrally planned economies have maintained adequate assets to be able to meet demand. Security of electricity supply has been consistently high. This approach has however also resulted in over-investment and additional costs to consumers.

22. In a liberalised market, investment decisions are made by market players who will bear the costs and risks of their decisions. This change generally eliminates the incentives to over-invest that existed in the traditional approach. It is intended to produce a leaner, but still reliable, electricity system. Most electricity markets contain a number of imperfections and distortions that could have a negative impact on security of supply. Limited demand-side sensitivity to market conditions aggravates capacity shortages during peak-demand periods. Price distortions caused by a number of factors may render some investments, such as those on peaking and back-up capacity, unattractive. Policy barriers to the development of certain technologies and to the use of certain fuels may also discourage investment.

23. Investment in potentially high-risk technologies may be discouraged if the tools to deal with certain investment risks are not sufficiently developed. In some particular cases, stringent regulations and cumbersome licensing processes may deter investors. Since liberalised electricity markets are rather new, relatively little is known about the practical relevance of these potential problems.

VIII. EMERGING ISSUES CONCERNING INVESTMENTS IN GENERATION

24. A number of issues are emerging that are affecting investment in the electricity generation sector. Security of supply is one such issue. Security of electricity supply requires adequate and timely investments not only across the whole electricity chain, from generation, transmission through to distribution, but also for primary energy – gas, oil or coal – infrastructures.

25. There are a number of prerequisites for ensuring security of supply including:

(i) Investor confidence with regard to long-term projects;
(ii) Demand analysis and management;
(iii) Maintaining adequate reserve margins;
(iv) Innovation and new technologies; and
(v) Diversity of supply.

26. When looking at the current status with regard to investments the evidence suggests that the following is probably the picture confronted by investors:

C there is uncertainty over the final regulatory set up, prices and future supply needs;

- electricity demand is rising on average around 1.5 % per annum, whilst capacity levels are barely changing;
- reserve margins are falling in most markets and the ability to meet peak demand is in doubt in a number of countries;
- one single technology, notably Combined Cycle Gas Turbine (CCGT), dominates new investments; and
- there is a tendency for existing companies to consolidate and merge, rather than for new independent generators to be established.

27. There are also a number of related issues that have the potential to damage or have a negative impact on the climate for investment, including: concerns over the security of supply of hydrocarbons; safety and public acceptance concerns over nuclear; uncertainty over Kyoto and post-Kyoto perspectives; global financial confidence, particularly in the wake of the Enron scandal and losses in the South American energy markets; and the evolution of tax regimes (e.g. internalisation of external costs) and state aid.

IX. SECURITY OF SUPPLY & INVESTMENTS: EXISTING SITUATION

28. There are many factors working to constrain or limit the level of investments made in the electricity sector, including:

(i) the new EU Emissions Trading Directive, which imposes new costs that might lead to the devaluation of some thermal power plant assets. The Directive could also constrain the choice of fuels for electricity generation and create additional investment needs through the requirement for reduced-CO_2 emitting plants.

(ii) the EU Water Framework Directive, which constrains the development of hydro energy, despite the EU targets for the production of energy from renewable sources by 2010.

(iii) the current doubts over the future of nuclear energy. Support for renewable energy implies the need for back-up plants, which would not be operated at full load; hence investment in such plant would be less economic.

29. One example of a problem linked to investment constraints is the hydro-energy based Nordel system, where the reserve margin has been falling in recent years. However, Norway has postponed the construction of alternative gas-fired power plants until CO_2 emissions can be captured at source. In 2002-03, due to exceptional meteorological conditions the region experienced record low hydro reserves resulting in significant price rises on the Nordel spot market.

X. FUTURE TRENDS

30. The national electricity markets of the region will progressively merge into a single market, but this could take many years and will probably first occur via regional markets. In this context the following points are of significance:

- Strong short-term focus on costs combined with environmental pressures will lead to greater reliance on gas-fired power plants with their lower capital costs, shorter construction times, and fewer staff.

- Whether the market players will continue to build other types of conventional plants, the answer to which appears to be "yes" when looking, for example, at the recent outcome in Finland to build a new nuclear plant.
- Renewable energy sources and combined heat and power (CHP) hold a privileged position in terms of protection of the environment. Expected short-term price developments vary across the different EU regions e.g. when comparing the continent, Iberian Peninsula, the United Kingdom and the Nordic region.
- Capacity margins are already low in a number of countries. New peaking capacity is needed now or will be very soon.
- Prices in some markets could therefore increase; which raises the question as to whether there will be political pressure to interfere.

31. There are a number of guiding principles when looking at security of supply and investments:

- The building of new electricity plants and associated infrastructure generally has long lead times and hence now is the time to address the problem of ensuring investments.
- Cost recovery is no longer guaranteed. Over US$ 100 billion has been lost by the merchant power plants up to 2002 in the United States of America, United Kingdom, etc due to the falling wholesale prices.
- Generators need a guaranteed outlet for their power plant proposals to be bankable – hence there is a tendency to bundle generation and supply.
- In theory, the market may solve all the problems; only the right price signal is needed. However, in order to achieve a balanced fuel mix and ensure security of supply, some additional means of stimulating investments may be needed in practice, such as 'green' certificates and security premiums.
- Even to ensure adequate conventional capacity, solutions such as capacity payments might need to be considered.
- Increased levels of interconnections can improve security of supply and could reduce the need for reserve capacity. Grid investments, however, need to be economically justified and will not occur without specific incentives.

XI. HOW TO FACILITATE INVESTMENT – LOOKING FOR SOLUTIONS

32. A key issue for the transition economies is how to create the appropriate environment to encourage investment in the electricity sector. A number of conditions guarantee a stable investment environment during the period of pre-liberalisation/privatisation/unbundling. The following are viewed as the conditions for an optimal investment environment with minimised risks:

- Long-term contracts (Power Purchase Agreements (PPAs))
- Appropriate return on capital for investors
- Cost-reflective prices on producers' domestic markets
- A regulatory approach that encourages investments
- Market-based approach as opposed to government intervention – although this issue can be debated.

- Appropriate treatment of electricity from renewables (i.e. the need for subsidies: feed-in tariffs, 'green' certificates – this issue is also still debatable).
- Transparency, particularly to avoid cross subsidies until unbundling is achieved and also financial and/or administrative separation of generation-transmission-distribution TSO
- Good monitoring of security of supply
- Developed and harmonized regional markets
- Reliable, stable and transparent legal and regulatory framework

33. The existence of all of the above factors can help to encourage professional as well as financial investors/banks to invest in the sector in this region.

34. Mitigating risks and creating the appropriate environment to encourage investment is the key goal. It is clear that many of the problems highlighted in this paper will still exist in the coming years or even longer and it will be impossible to eliminate all of them. Nonetheless, it is absolutely essential in the interest of security of supply to minimise the risks for investments. *However, it must be emphasised that in a market economy, investments will never fully be without risks.*

35. The *simple* solutions – long-term PPAs with government guarantees, adequate return on capital, acceptance of cost-based prices for individual power plants etc – may encourage investment, but could cause a reversal back to the pre-reform conditions i.e. no or limited competition, low economic and technical efficiency, central regulation, and subsidised prices. In the absence of subsidies, prices would exceed international competitive price levels.

36. These conditions are all exceedingly complex. Due to the diversity of national conditions and the absence of experience and success stories, the issue needs to be dealt with with great care. But it is clear that both investments and increased security of supply need to be encouraged which will require money to be paid by the government (i.e. by the tax-payers) and/or by the customers and/or by the electricity sector.

37. The following are considered to be amongst the key or critical conditions for encouraging investments in the transition economies:

- Political-economic stability;
- Sound economic and energy policy;
- Legal system (e.g. abiding by the Energy Charter Treaty);
- Stable regulatory framework;
- Cost-reflective or liberalized energy prices; and
- Existence of long-term contracts – it is recognised, however, that this point is controversial.

38. When seeking a solution to the investment and risk problems, there are three potential models. These three models offer solutions for encouraging investments and mitigating risks in a variety of ways.

(a) Mitigation of Risks Model (Return of the "Stronger State" Model)

39. It is highly likely that this model will prevail in many of the States of the FSU and in some of the Balkan countries for many years to come. In this instance, the government will have a strong and direct role in the supply of electricity and in the encouragement of investments; for these reasons the privatisation process will proceed slowly. Due to the relatively higher risks and lack of local capital, governments may have to guarantee the return on investments to foreign investors by direct methods (e.g. long-term PPAs) or by indirect methods (e.g. lower taxation or a guaranteed return on the invested asset by price regulation; because of the higher risks, the return may have to be higher by some 1-2 %).

40. Within this framework it may be that long-term agreements will make a comeback in the future. Many banks are likely to welcome such a situation. However, in this environment, only a small portion of the electricity market will be liberalised and "public customers" will dominate the market. The market share of the public customers with regulated tariffs will be an area where the government is able to implement PPAs.

41. Government institutions will monitor demand and generation capacities (using the presence of national development plans, demand projections etc) and, if necessary, suggest the building of new power plants. In extreme cases, the state can itself build a power plant to cope with the increasing demand. A more market-related solution could be the offer of state guarantees to financial or professional investors or to encourage investments through less direct ways such as lower or no taxation of the investment for the first years of the operation, cost-based prices regulated by an independent office, risk sharing techniques and other techniques. These advantages can serve to make these projects bankable for commercial banks or international utilities.

42. In the "stronger state model", the state may take on some of the risks and in this way, risks may become manageable. Evidence suggests that risk sharing between state and investors needs an extremely well functioning legal system to solve all the related discussions/problems.

43. In this economic environment, the promotion of renewable energy sources could be motivated by international treaties such as the Kyoto Protocol and through state subsidies. However, feed-in tariffs, green certificates and levies on fossil fuels could also play a role.

44. All these steps may lead to a relatively good situation in terms of security of supply, but with all the disadvantages that were highlighted in the UNECE paper "Guidelines on Reforming Energy Prices and Subsidies" (ECE/CEP/103) i.e. lower economic efficiency, loss of GDP and wastage of energy. There are also higher risks related to the independence of regulatory bodies, local courts and to the interference of politicians in the so-called 'interests of the nation'.

(b) Strong Risk Taking Ability Model (The Oil Company Model)

45. The logic behind this model is as follows: there are high risks associated with investing in the electricity sector and hence, players are needed who are able to take these risks. This way of thinking is in line with the current worldwide globalisation of the energy business. As the "oil company model" shows, only the strongest players are able to successfully compete in the market over the long-term.

46. In the oil industry, the market is dominated by strong multinational companies with both upstream and downstream activities and pipelines as well as retail outlets. The globalisation process favours large players that are created either by a friendly merger or hostile takeovers.

47. In the electricity sector, instead of the vertically integrated national model, a partially vertically integrated international or horizontal model might prevail (with upstream-downstream-pipelines i.e. generation-distribution-transmission TSO over several countries).

48. The *acquis communautaire*, the harmonised legal system, the EU Directives, the Euro, the WTO trade policy and many other factors related to the EU can easily promote the development of the oil company model (i.e. fewer larger players with their own generation, transmission and distribution assets to the extent permitted by law).

49. If this model increasingly prevails in Europe, investments will principally be made by the largest players such as Electricité de France (EDF), E.ON, RWE and the Russian generators. (In Europe, the market shares of the five largest power companies were 49 % in 1998 and 52 % in 2001.) These large companies now have experience of doing businesses internationally on many continents and in many fields e.g. gas, water, communication etc and they have the stability and strength to take high risks. However, if this model does dominate the European market, there is the possibility that it may constrain competition.

50. It is through their own expertise, their sheer financial strength, their own banks and also "lobbying abilities" that these large companies are able to cope with all the investment problems and risks. With their large and manifold portfolios they are also able to tackle the stranded asset problem. The reality is that commercial banks will lend to these energy 'giants', but will hesitate to lend to smaller companies.

51. To attract investment, some co-existence with local financial structures will also be necessary. But this financing structure has to be attractive, stable and transparent. Another important factor is the early completion of liberalisation and also a reduction as far as possible of political interference in markets.

52. In a liberalised market, prices will signal the need for new investments in power generation plant and transmission infrastructure. In many countries price spikes can now provide the right signals for making investment decisions, however for the social and political reasons previously touched upon, necessary price increases can be difficult to implement. Therefore support mechanisms may need to be established for local populations.

53. The use of energy price caps poses difficulties in providing the right signals to both generators to invest and to customers with regard to saving energy, decreasing energy peaks and also to switch fuels.

54. At a certain level, all players need to take risks. In the oil company model, the more financially secure investors are able to take the risks. In the "stronger state model", the state may take over some of the risks. Very probably, the risks as well as the costs of stranded assets will be divided among the incumbent power companies, the state and the customers. In order to manage the risks, investors are keen to shorten the amortisation period, however higher amortisation is likely to mean higher power prices. In this risky environment, the operation of Independent Power Producers (IPPs) – in recent years generators were unprofitable in many countries – and the "merchant model" might seem difficult to sustain.

55. This Strong Risk Taking Ability Model has a number of advantages: it offers a market-friendly solution and does not require state subsidies. However, difficulties may also occur with this model: the vested interests of the multinational power companies may not necessarily lie in the construction of large reserve capacities, which could affect security of supply and lead to price spikes.

(c) The Hybrid Model – A Mix of Models (a) and (b)

56. In the situation of incomplete liberalisation and privatisation, the two previous models can co-exist i.e. a hybrid model. This third model may evolve in the European electricity market, with more or less emphasis on the first or the second model depending upon the country.

XII. SPECIFIC PROBLEMS OF TRANSMISSION AND DISTRIBUTION NETWORKS

57. In the case of transmission and distribution networks, the administrative and/or financial separation of a generation-transmission-and-distribution TSO is a basic requirement due to the importance of transparency, particularly in order to avoid cross subsidies until unbundling is achieved.

58. The security of electricity supply requires adequate and timely investments across the whole electricity chain, from generation, through transmission to distribution. A number of the problems faced in securing this are highlighted below:

- Distribution networks need ongoing refurbishment and improved bundling, but many distribution companies are not earning adequate returns. The financial operation of distribution companies depends on tariffs; therefore stable and correct regulation is a precondition for investments in distribution networks.

- The regulatory regime is one of the key strategic concerns of the management of distribution companies.

- Distributed generation should not be viewed as a substitute for investment in grids – wind power, for example, can create additional needs for grid reinforcement (a basic problem encountered on the transmission network is that the direction of the transmission can change rapidly when wind power generators start to operate).

- Power from renewables is usually subsidised, but the construction of the necessary new networks is not.

- The internal electricity market has led to congestion on many transmission lines hence investment is needed to eliminate the bottlenecks.

- Additional cross-border links are essential to create a single electricity market; but the common 10 % target figure seems a bit arbitrary.

- There is a low public acceptance for the construction of new electricity lines, but the placing of such lines underground is not feasible.

- Increased interconnections can improve security of supply and could reduce the need for reserve capacity. Grid investments need to be economically justified, but will not take place without specific incentives (market or otherwise).

- TSOs need incentives to build priority links, whilst democratic solutions to the issue of low public acceptance are developed in parallel.

XIII. IMPACT OF FUEL PRICE AND TECHNOLOGY

59. On the world market, oil prices are fairly volatile, influenced by political impacts and the market itself. The price of gas is directly related to oil prices. In the longer-term prices will probably remain stable for coal and nuclear power, while the evolution of oil prices (and, accordingly, gas prices) is uncertain, with increases anticipated.

60. Prices may also be influenced by environmental and economic decisions such as environmental levies or internalisation of external costs.

61. In the case of larger investments, the following factors will determine the choice of technology to a greater extent than fuel prices:

(i) Security of supply e.g. whether there are gas or oil pipelines or coal mines in the immediate vicinity.

(ii) Issues related to the environment, including environmental protection, environmental policy, emission (CO_2) limits (Kyoto Protocol commitments), and the EU Emissions Trading Directive. The Emissions Trading Directive could possibly have the effect of raising average electricity prices; coal- and oil-fired plants will suffer from higher operating costs, whereas gas-fired generation, nuclear power plants and wind-power installations will see the reverse.

62. In the current environment, investors seek to mitigate their risks by building less capital intensive (smaller) power plants, with a high level of environmental acceptance and utilising the currently lowest-cost fuel (i.e. gas) and with flexible operation i.e. for peak demand. Hence these criteria often lead to CCGT being the technology dominating new investments.

XIV. LINK BETWEEN INVESTMENT AND MARKET LEVEL PRICES IN THE ELECTRICITY SECTOR

63. Larger investments are less influenced by current energy prices as the rate of return for power plants ranges from 10 to 25 years. As a result, the approval or rejection of an investment depends upon the simultaneous analysis of long-term projections for fuel and electricity prices as well as for the specific production costs of the power plant. (Projections usually contain a high level of uncertainty.)

64. Certainly, authentic and correct pricing (i.e. cost-reflective prices), implemented over the long-term serve to mitigate the risks to the investor. In an uncertain investment environment, investors require power plants with higher rates of return.

XV. TREND TOWARDS INVESTMENT IN REFURBISHMENT OF EXISTING STOCK?

65. Owing to the uncertain investment environment and lower costs of capital, financing the refurbishment of existing power plants/utilities is internationally more attractive to investors than the building of new plants. The same tendency applies to traditional (fossil) power plants because of more favourable (cheaper) prices and the simplicity of the licensing process required for the investment. This is confirmed by decisions to extend the operation of several nuclear power plants and to increase their capacity.

66. Under competitive pressures only the most efficient plants and technologies are likely to survive. Existing plants whose initial capital costs are either fully or partially amortised – whether nuclear, coal, hydro or gas-fired plants – are proving to be among the most competitive.

67. As previously noted, the IPP model may have difficulty to survive in the longer-term however, there may be some exceptions. An IPP generally is not able to take the risks that a large energy company can because of its limited financial strength.

68. Poland and Bulgaria are geographically situated in an excellent position to export electricity to Germany and Greece/Serbia and Montenegro, respectively. The problems, however, of transmission tariffs and shortage of investment in high voltage systems will make it difficult to take maximum advantage of this situation.

XVI. CHALLENGES TO FACILITATING INVESTMENT/WHAT ARE THE RISKS?

69. The nature or type of risks varies from country to country. Post EU-enlargement, the risks for the 25 Member States will be lower, while outside the EU (in the FSU) they are and will continue to be higher. However, the convergence of the new members will need to occur as quickly as possible with a progressive evolution towards EU-15 norms. The local parameters e.g. with regard to environmental and social policy will need to be taken into account so as not to de-stabilise the economic balance of these countries.

70. The risks faced by investors in the electricity sector have been highlighted above. In essence, for those countries remaining outside the EU, the most probable risks are: political and economic instability; legal and regulatory problems; and problems related to customers e.g. the high non-payment rates, poverty and lack of metering.

71. Privatisation is also an issue: there is sufficient evidence to prove that its advantages outweigh its disadvantages. For example, privatisation results in a more efficient mode of operation; reduced staff numbers; improved payment-rate of energy bills; and more capital for investments, maintenance and modernisation. However, it should be noted that privatisation has not always been successful. China, although not in the UNECE region, is an example of this; the privatisation process in China suffered from a range of difficulties, including legal and regulatory (e.g. the slowness of administrative processes and the breaching of individual contracts) and the setting of 'political' and not cost-reflective prices.

72. In addition to the political, legal and financial risks, other risks include changes in both fuel (coal, oil, gas, and nuclear) and electricity prices. Electricity prices not only depend upon fuel prices, but also on the relationship between surplus capacity, opportunities for imports, and daily and seasonal changes in consumption patterns; and the nature of pricing i.e. whether it is market-based or governmental. In the case of the latter, the issue of whether the price is cost-reflective or not becomes an issue. The value and range of tariffs, including wholesale, transmission, distribution, capacity etc also have an impact.

XVII. IMPACT OF THE CREATION OF A SINGLE EU MARKET ON INVESTMENT

73. Currently there is no real or only a limited internal electricity market within the EU; rather there is a fragmented electricity market of 15 players. Significant differences also exist between these countries. The "core" EU countries (France, Germany and a number of their neighbours) are better connected to each other (more transmission lines, cross-border links etc) and there is a more intense import-export activity in this region.

74. The transmission lines, however, have many bottlenecks and the problems related to investments in these lines have a negative impact on the development of the international transmission lines. If transmission line tariffs are high then the competitive cost advantage of a generator is eroded within a short distance with the consequence that there is no long-distance trade. If the transmission line tariffs are low then the investors might not invest in transmission lines due to the lack of return on capital and hence the bottlenecks could remain, making international electricity trade difficult.

75. Many EU as well as non-EU governments might be tempted to protect their own electricity industry from international competition in the electricity market. Therefore there might be a limited willingness on the part of governments (or local power utilities) to invest in new international transmission lines.

76. However, mainstream thinking says that with the time, the EU internal electricity market will steadily grow and strengthen and that one day there will be a real internal market.