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Avoiding electricity blackouts in Europe

Report
Committee on Economic Affairs and Development
Rapporteur: Mr Miloš Melčák, Czech Republic, Socialist Group

Summary

Europe needs an efficient and reliable electricity supply system to ensure the quality of life of its citizens and the competitiveness of its industry. The blackouts that affected several European countries in 2003 were brief but costly disruptions. They served as a wake-up call, revealing the weak links in Europe's electricity supply networks and the insufficient co-ordination between electricity markets at national and regional level.

The report examines how blackouts may be avoided in future. To this end, it looks at the underlying reasons behind power cuts that have struck Europe, the United States and Canada in recent times. It also reviews the likely effects of ongoing industry deregulation on electricity systems. Although total reliability in the electricity supply may be a utopian goal, many improvements are possible. Efforts to stabilise electricity consumption, achieve energy savings, enhance network co-ordination and upgrade production capacity are priority fields of action. Better taxation, pricing and regulatory policies, speedier implementation of relevant legislation and harmonisation of technical standards for interconnected networks across Europe are called for.

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I. Draft Resolution

1. Europe needs an efficient and reliable supply of electricity for the well-being of its citizens and for its economic development. The blackouts that struck Italy, the United Kingdom, Spain, Denmark, Sweden and other countries in 2003 - and the city of Athens in the summer of 2004 - were brief but costly and served to draw attention to the weak links in Europe's electricity supply networks, insufficient co-ordination between national or regional electricity markets and, occasionally, insufficient production capacity. It is important to prevent any reoccurrence of such breakdowns.

2. The ongoing reforms in Europe's electricity industry are challenging the traditional organisation of the industry, by which state entities have long held primary responsibility for investment and where the priority has been to ensure ample spare capacity to cover needs at all times. The present opening of markets, resulting inter alia from the completion of the European Union's Internal Market, weakens the position of monopolies in electricity production and supply while facilitating market entry by new participants as well as cross-border exchanges. This welcome development will, however, at the same time require a more coherent regulatory framework at national and European level, not least in order to prevent undue price increases by power suppliers.

3. Although perfect reliability in electricity supply may be impossible to reach, much could be done to raise it through efforts to stabilise electricity consumption, achieve energy savings, improve network co-ordination, increase production capacity via new investment and facilitate the financing of energy infrastructure, while paying due heed to the protection of the environment.

4. As electricity can neither be efficiently stored over time nor transported over large distances without substantial energy loss, strong and unpredictable fluctuations in demand – due, for instance, to weather conditions – can cause major disruptions. Measures to better monitor and predict energy demand are therefore particularly needed. Potential energy savings that can be reached without affecting living standards or output are estimated at between 15 and 35% in the European Union, with even higher savings possible in non-EU countries in Central and Eastern Europe.

5. The Parliamentary Assembly, as regards Council of Europe member states:

i. recommends that efforts be undertaken to improve interconnections between Council of Europe member states and co-operation among operators of transmission system as regards the sharing of data in real time, in order to realise the economic potential of the networks involved and enhance their security;

ii. believes that a more intensive overall co-ordination of network and power generation investment is needed so as to permit a more rational use of resources and reduce the uncertainty surrounding long-term projects and in this context welcomes the 2003 commitment to realising the Regional Electricity Market (REM) for South-East Europe under the region's Stability Pact;

iii. asks Council of Europe member states to make better use of taxation, pricing and regulatory policies in order to:

a. promote energy efficiency;

b. ensure an adequate framework for maintenance of, and new investment in, electricity networks and power generation capacity;

c. ensure efficient reserve capacity for electricity production and supply to cover peaks in demand;

d. remove existing distortions resulting from tariff and other trade barriers;

e. encourage the use of new sources of energy such as solar and wind power, as well as new technologies, such as laying electricity lines underground in special circumstances, especially in urban and environmentally sensitive areas or in regions exposed to adverse weather conditions.

6. The Assembly, as regards the European Union and its member states:

i. calls for the speedy implementation of the relevant Directives of the European Union and supports its latest proposals in this field, especially regarding energy efficiency, electricity infrastructure and the security of supply;

ii. invites the European Union to review the guidelines for its trans-European energy networks, so as to promote the integration into the wider European energy market of the electricity systems in its ten new member states as well as in those of neighbouring countries outside the Union.

7. The Assembly fully supports the Union for the Co-ordination of Transmission of Electricity (UCTE) in its efforts to harmonise technical and administrative rules for interconnecting the networks of its twenty-three participating countries, on the basis of existing security and reliability standards.

8. Finally, the Assembly believes that a new European Centre for Technical Coordination of European Transmission Systems and Cross-border Electricity Trading is needed for the proper co-ordination of the above measures.

II. Explanatory Memorandum by Mr Melčák, Rapporteur

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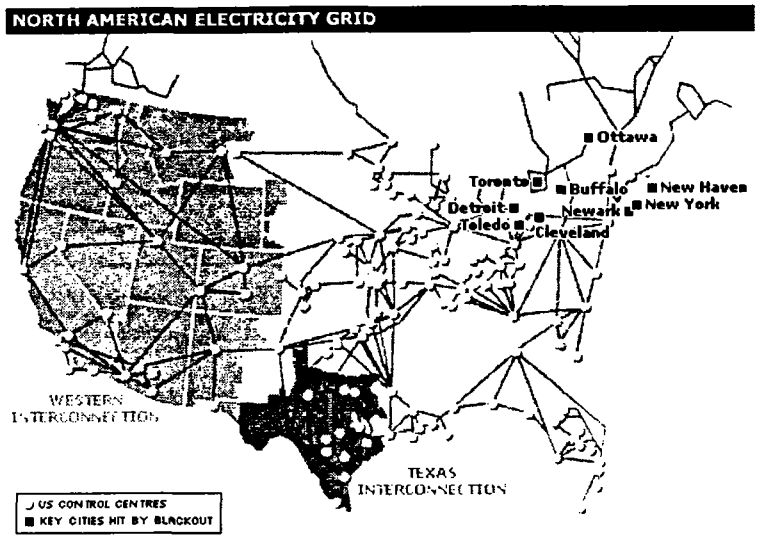
1. INTRODUCTION

1. Power systems, part of the hidden inner workings of modern society, suddenly took centre stage during the late summer of 2003, due to a series of dramatic power outages. These served to remind us how vulnerable to and reliant upon technology we have become.

2. The first wake-up call hit the United States and Canada on 14 August 2003, when large parts of the country experienced the biggest electricity blackout recorded. In what appears to have been a technical failure, three power transmission lines collapsed, depriving some 50 million Americans and Canadians of electricity for up to 36 hours. Fortunately, the incident was well handled, with many of the post-September 11 contingency plans coming into effect. The cost of the blackout was nevertheless considerable. The economy of New York City was estimated to have lost $ 1.1 billion (€900 million), or roughly $ 36 million an hour, due to the closure of offices, restaurants and cinemas, overtime pays to police and other city workers, the loss of perishable goods, tax revenue and transport fare inflows as the subway and train systems shut down. Other cities, such as Detroit, Cleveland, Boston and Toronto, faced similar costs. Many factories had to send home thousands of workers and employees and it took airlines several days to work through the backlog of flights.



3. A frequent reaction in Europe to these events was to assert that the problem lay with the US electricity system and was highly unlikely to occur on this continent. A statement by the European Commission published on 14 August stated that "the European electricity market is much more integrated in terms of organization, regulation, market liberalization and cooperation between network operators. Although the possibility of a significant power cut cannot be ruled out, the European electricity market appears to be better equipped to deal with such situations". This affirmation proved to be an overstatement as a series of large power cuts across Europe immobilised several countries in the following weeks.

4. On 28 August 2003 London was hit by a major outage, which left about 410 000 homes and businesses without electricity. Thousands of passengers were stranded during the evening rush hour as 1 800 trains were halted and 60% of the underground network became inoperative. Two million consumers in southern Sweden and 1.8 million in Copenhagen experienced a massive power cut on 23 September 2003. In Italy, following several planned power pauses over the summer in order to cope with record high temperatures, the worst blackout in Europe since World War II occurred on 28 September - leaving 50 million people (almost the entire population) without power for up to 18 hours and causing several fatalities. Major incidents were also reported on the Austrian-Czech power line, in Spain and in Portugal, and a critical situation of a near-blackout was recorded on the power line between Hungary and Austria.

5. Your Rapporteur therefore feels it is necessary for the Parliamentary Assembly to examine reasons for the recent failures in Europe's electricity market – in terms of production capacity, efficiency, organization, regulation, market liberalization and co-operation between network operators (Doc. 9976) – and to make the necessary recommendations aimed at avoiding future power supply disruptions, which are so harmful to our national security, public health and economies. He will look at the current situation and its short-term implications for the increased stability of European power systems, on the understanding that another Rapporteur, also from the Committee on Economic Affairs and Development, will, in a separate report, deal with Europe's mid- to long-term overall energy security (Doc. 9946).

2. WHAT WENT WRONG IN EUROPE'S POWER NETWORKS?

a. Immediate causes

6. Though on the surface of it these massive power cuts all look like isolated incidents, and their concurrence a mere coincidence, deeper analysis permits some common faults to be identified. There is also a general relief in agreeing that none of these cuts were caused through ill-intentioned acts, as had been feared initially.

7. Prior to examining the causes, however, we should note that there are two types of power outage, both of which occurred in 2003. Firstly, there is a *power cut*, which results from technical failings (such as the mal-operation of interconnections). Secondly, there is a *blackout*, caused by a shortage of generating capacity. The recent incidents in the USA, the United Kingdom, Scandinavian countries and Italy can be attributed to the first type of power cut, as they all were triggered by initially minor technical incidents that were subsequently mishandled and escalated into much larger events.

8. In the USA, the original failure is thought to have started when an electricity transmission line became entangled in a tree in Ohio. This caused one cable to fail, transferring its power to another, which subsequently overloaded and also failed. This in turn led to the transfer of all the power from the two cables to a third and so on, causing the general line overheating, sagging and, finally, a failure. As the "cascade" gathered momentum in one area, there was not enough spare capacity in the regional transmission system to absorb the strain. The network quickly reached full capacity and power stations shut down. Safeguards should normally be in place to keep such 'cascades' of failures isolated, but they did not work.

9. The November 2003 report by the US and Canadian governments attributed the blackouts to a range of causes, including sloppiness and structural faults, and claimed that they could have been avoided (though once the problem escalated to a certain magnitude little could be done to prevent it from escaping control). The fault is largely seen as that of the Ohio-based power plant operator FirstEnergy, whose Eastlake plant unexpectedly shut down, and whose alarm system should have alerted employees to the transmission fault. Another contributing factor was the company's failure to trim trees that short-circuited three power lines in Ohio. The company violated four specific voluntary standards set by the NERC (North American Electric Reliability Council), whilst another grid operator, Midwest, was found to have violated two industry standards. Communication was also a problem (as Midwest lacked up-to-date information on what was happening with FirstEnergy's power lines) slowing attempts to stop the power failure from spreading.

10. A subsequent probe into previous major North American power outages found that the causes of the August 2003 blackout were strikingly similar to those of earlier outages. The key findings pointed to inadequate understanding of the system or arising crisis situations, insufficient tree trimming and violations of the voluntary reliability standards administered by the NERC. Recommendations were to reinforce mandatory electricity reliability standards and government oversight in both the US and Canada; to strengthen the institutional framework of the NERC; to address deficiencies identified by First Energy and other reliability bodies; to improve the funding, training and certification requirements for operators, reliability co-ordinators and operator support staff; and to upgrade the physical and cyber security of the network.

11. The default of the British electricity network in London was traced to a badly-installed fuse at a power station, though some experts claim that a backlog of poor maintenance was also behind the fault. Scandinavian electricity officials said the power cuts started when a main transmission line connecting Sweden and Denmark was affected probably by a storm which swept through the area, bringing down trees.

12. The Italian failure in September proves a similar story to that of the US, with an initial, regular incident of a falling tree escalating due to communication problems between Transmission System Operators (TSOs). As with the US system, safety requirements were in place in Europe to ensure that one isolated incident should not bring down the whole system (the so called N-1 rule), but it did not prove wholly successful. Storms over the Alps knocked out a transmission line carrying power from Switzerland to Italy. Power was transferred to a second line, which was able to cope with the extra overload for 15 minutes. The Swiss operator Etrans called its Italian counterpart (GRTN) 10 minutes after the original incident, requesting a reduction in Italian imports. This was achieved 10 minutes later, but beyond the stress point for the second, now overloaded, line. This then overheated, sagged and brought down a second tree, causing power to surge into the rest of the transmission system. This then became unstable, leading to the breakdown of several Italian generation plants and the eventual blackout of the entire country. The official report of UCTE (Union for the Coordination of Transmission of Electricity) blamed Swiss authorities for not reacting quickly enough as the crisis unfolded, and criticized information issued by Etrans as lacking a sense of urgency, so that the Italian operators failed to make a drastic enough response.

13. The second type of failure, or *blackout*, is caused by an excess surge in demand. This was the case with the Italian outages in the summer of 2003, and was at the root of the much publicized crisis in the Californian electricity industry during 2001. These blackouts are planned 'load shedding' operations with supply rationed to cope with a lack of electricity generation. Both California and Italy are not able to meet their own electricity demand and rely heavily on imports, obtained via interconnections with neighbouring areas.

14. Italy's problems started 15 years ago when the decision was taken to rely on imports after decommissioning the country's nuclear power plants without replacing them with new generating capacity (this was due to a strong environmental lobby objecting to the building of power plants along the coastline that attracts many tourists). Italy imports 17% of its electricity, compared with an average of 2% across the rest of the European Union. This is an inherently more risky strategy than relying on domestic generation. During the summer the country experienced a further rise in demand for power, caused by record high temperatures which sent air-conditioning usage into overdrive, and also had the effect of making power plants less efficient due to the high temperature of the water to be cooled. 5% rolling blackouts were consequently imposed. The California crisis came from a drought in the Pacific Northwest which reduced the imported hydroelectric supplies on which the state depends. (*More details on power generation issues will be included in Mr Berceanu's report on Europe's long- term energy needs)*

b. Background problems

15. Technical failures and a surge in demand coupled with a shortage of supply may be the simple explanations behind this series of power outages. However, longer term trends within the European electricity industry also need to be examined. We shall start with the implications of industry deregulation[1].

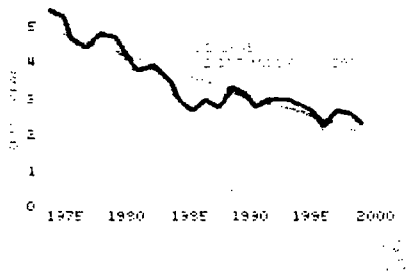
16. *Deregulation* of the electricity system started in the US, ushering in market forces and many small companies into a sector that used to be dominated by a few big national corporations. Increased competition amongst *power suppliers* has cut profit margins, leaving firms with less cash to invest in maintenance and upgrades and making them reluctant to make new investments (we should also recall the Enron affair, which among other things caused a collapse in that and related companies' share prices and made it harder for them to raise capital). The problem is particularly acute in the area of *power transmission*, where high-voltage capacity is expected to grow by only 5% over the next decade, whilst power generation is set to increase by 30% and demand by 20%. Investment is also hindered by the low level of authorized transmission charges, which are

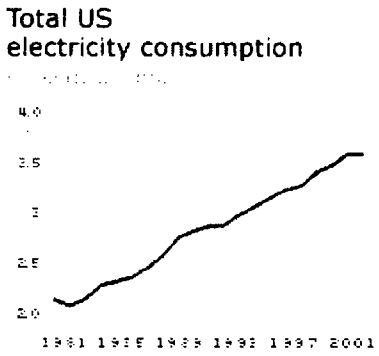
[1] With the entry into force of the EU electricity Directives (2003/54 and 2003/55) and Regulation 1228/2003, all EU member states are set to complete full market opening by 2007 at the latest.

sometimes insufficient to cover capital costs. The dangers of such a situation were amply demonstrated by the power cuts in the Northeast, where there was plenty of supply from private companies at the time of the blackout but not enough transmission lines to take it where it was needed. Many electricity lines are running close to their limits, especially when extreme weather sets in, and several high-voltage transmission lines are regularly jammed up, especially in the New York area.

17. These bottlenecks make the whole system less responsive to extra demand or excess capacity in different regions, making it more difficult for different areas to help each other out. The government used to take responsibility for ensuring that each area had enough spare capacity to act as a safeguard in times of difficulty. However, since the deregulation of the industry in the 1980s, the rules have been much less strict. There is no incentive to invest in interconnection with other states, with the result that cooperation between networks is low. An absence of the obligation to supply has led to the fragmentation of the national system, as transmission lines have fallen in the cracks between state and federal power. Individual states cannot agree on who should pay for lines that run between them, yet they are often reticent to allow the federal government to take over some regulating powers.

18. The problem is that the US transmission system, designed decades ago for local coordination and emergency use, was not designed to handle today's large scale trading and transmission of electricity across regions. Indeed much of the grid network is 60 years old, with long periods of under-investment by power companies. This has produced a US electricity grid that is highly vulnerable and inadequate to meet growing demand fuelled by such additional strains as the increased use of air conditioning and personal computers. US power demand surged by 30% in the last decade, while transmission capacity grew by just 15%. Former energy secretary Bill Richardson even claimed that: "We're a superpower with a third-world grid".





19. A similar story lies behind the European problems, with deregulation leading to added competitive pressure on electricity prices, investment and infrastructure in the face of surging demand. Over the past decade, the cost of generating power has halved in many countries due to greater efficiency, but at the same time, it has become harder to make a profit from the business due to falling electricity prices to industry in most EU member states. This makes firms more reluctant to invest in the infrastructure needed to modernise power grids, and to leave spare capacity sitting unprofitably in the system to cope with occasional surges in demand. Meanwhile, industrial demand for electricity continues to grow throughout the developed world. In addition, the heat wave in the summer of 2003 in much of Europe boosted sales of household air conditioning units, putting more pressure on power generating stations and on the grids that carry power supplies.

20. On top of systems' becoming older and less able to cope with the increased demand, *privatisation* has meant less coordination to spread demand and backup systems more evenly. *Electricity cannot be efficiently stored*[2], so managing big fluctuations in demand or in power output, especially of wind-powered plants (their power generation fluctuates depending on the weather), can be difficult. To overcome this, there is a growing trend for countries to join together and link their national grids into big regional networks. This makes it possible for individual countries to manage peaks in demand without having to carry too much surplus capacity, but it at the same time makes them vulnerable to a domino effect when equipment breaks down[3]. As in the US, the European grids were constructed for in-country 'mutual help', on the assumption that each region was self-sufficient in supply and could survive if a problem occurred elsewhere on the national network. The system was, however, not designed for a balance of power, or reserve power, to be bought abroad.

21. Within the European Union and its immediate vicinity, limited interconnections divide the area into at least four distinct electricity markets: the United Kingdom and Ireland; NordPool of the Scandinavian countries; the Iberian Market; and Central EU[4]. The well-interconnected 'central' market (including France, Germany, Italy, Belgium, the Netherlands and Austria) makes up two thirds of EU electricity consumption and some of its links are congested during the periods of peak demand. The Nordic and UK markets have limited capacity links with the central market, whereas the linkage between the Iberian and Central markets is minor. To improve interconnections, substantial investments are needed. In 2000, the European Commission identified a number of priority links to be developed, including with virtually all neighbouring countries[5].

22. The European transmission systems risk becoming even more complex, and potentially unstable, as the network widens. Several eastern European states (e.g. Poland, Czech Republic, and Hungary) joined the western European network during the 1990's, with Bulgaria and Romania set to link up in the near future. There are plans to connect regions such as the Balkans[6], possibly the Maghreb area of North Africa, Turkey, the three Baltic republics (Estonia, Latvia and Lithuania) and even some CIS (Commonwealth of Independent States) countries, creating a link reaching all the way to Vladivostok (via Kazakhstan, Mongolia and even China). The latter network extension would really mean pushing way beyond the limits of any manageable system and could lead to problems such as increased oscillation and insufficient co-ordination between TSOs (Transmission System Operators). This would add instability to the system rather than improving the security of supply.

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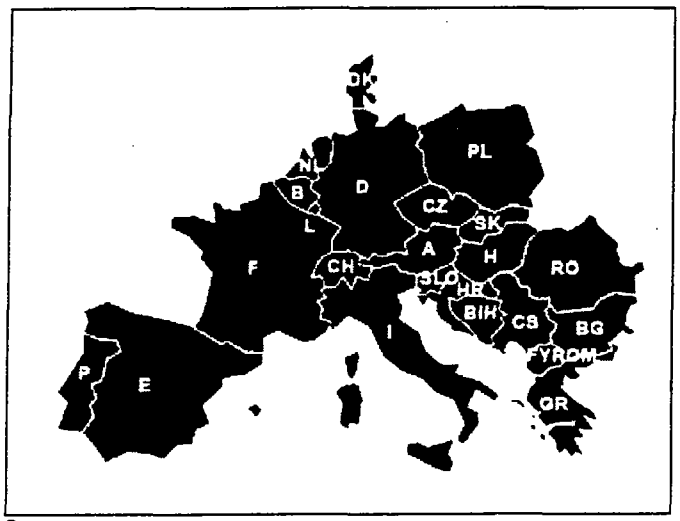
[2] Electricity is subject to numerous physical laws. One such law, known as Kirchoff's Current Law (abbreviated as KCL), states that the current flowing into a junction in a circuit (or a node) must equal the current flowing out of the junction and at any instant in a circuit the algebraic sums of the currents entering and leaving a closed circuit are zero.

[3] Electricity flows are to a large extent determined by network layout, line dimension and the geographical location of the production and consumption centres. Every major change in the layout of the network, either planned or forced by failures, immediately causes flow changes throughout the whole of the interconnected system. Even the generally accepted security criterion 'N-1' (the system must be operated so that any one element outage does not reduce the overall production and/or consumption) does not ensure 100% operational security, as it cannot be checked continuously for the whole of the interconnected system and its interpretation varies from TSO to TSO due to their specific appreciation of the acceptable risk level on national systems. Another problem for system control is the provision for the so-called "free traded capacity" on interconnection interfaces without knowing if it will in fact be used. System overloads might thus occur. As a result, TSOs tend either to decrease free trade transmission capacity or to reduce the level of operational security.

[4] "Security of Supply in Electricity Markets. Evidence and Policy Issues", 2002, International Energy Agency.

[5] More information can be found in COM (2000) 2683 final and the "Communication from the Commission to the Council and the European Parliament on European Energy Infrastructure" by the EU Commission, 2001.

[6] Following the Athens "Memorandum of understanding on the Regional Energy Market in South-East Europe and its Integration into the European Community Internal Energy Market" of December 2003 concluded with the support of the Stability Pact for South-Eastern Europe.



Source: www.ucte.org

23. If transmission problems were behind the first type of power cuts discussed – i.e. those which took place in the US and Europe in August and September 2003 – then generation problems lie behind the second type outlined, that is, those in Italy and California. *Industry privatization has so far largely failed to create an environment suitable for investment in power plants and transmission lines.* This is partly due to low returns and profitability, as was pointed out in our description of the transmission problem. However, an unclear regulatory environment has not helped, either. Coal generation is seen as dirty, nuclear as unsafe; renewable energy sources are underdeveloped and still marginal, while the 'dash for gas' makes Europe potentially as vulnerable to unstable outside import sources as is the case with oil. All of this does not suggest a healthy environment for making the sort of long-term investment decisions required for power infrastructure projects.

3. A COMPARISON BETWEEN THE US AND EUROPEAN SYSTEMS

24. Given similar problems over the summer 2003, are there really any substantial differences between the European and US electricity systems? Both, after all, seemed equally vulnerable to both transmission and generation problems, to power cuts caused by TSO coordination problems, and to blackouts caused by a lack of supply.

25. There are, however, key differences between the two systems. First of all, in Europe the roles of the different parties involved in the electricity market are clearly defined. Most importantly, the network operators are separate companies, and are much more independent than in the US, where private operators generate and market electricity and may also own regional transmission networks. Reserve capacity is lacking in some parts of the European Union (e.g. Italy and Greece), but is sufficient across the EU as a whole, unlike in the USA.

26. However, the main difference between the European and US systems is in the more controlled way in which Europe is going about the deregulation and privatization process. In the 2003 EU Directive setting up the internal market for electricity[7], member states are required to designate an independent regulator responsible for ensuring non-discrimination, effective competition and the efficient funding of the market, as well as fixing transmission charges to ensure a proper return on

[7] Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC OJ L 176, 15.7.2003. Consider also Regulation (EC) no. 1228/2003 on conditions for access to the network for cross-border exchanges in electricity. All businesses should be able to choose electricity suppliers by 2005, households by 2007.

investment. The regulator may also impose measures in event of a crisis. Meanwhile, in the US the FERC (Federal Energy Regulatory Commission) lacks clear jurisdiction over reliability issues, and the NERC (the transmission industry body) has only voluntary rules which have proven largely insufficient.

27. The European Commission further pointed out in 2001 that the creation of a fully functioning single market for electricity and gas would be dependent on further interconnection between member states and on the better use of the infrastructure through greater coordination and transparency[8]. A stable regulatory environment supportive of investment in new infrastructure is seen as a requirement for the successful functioning of the internal market. A minimum target of 10% interconnection on installed generation capacity has been set. As new interconnected infrastructure will only be created if the investment costs can be covered by transmission charges, the European Commission is studying extra sources of funding to ensure this takes place (e.g. increasing funds from the trans-European network budget from 10% to 20%). Operators also have a pan-European association designed to coordinate the trade of electricity across borders, and to share information in order to detect potential overloads in advance. In the US, there is no such coordination between operators.

28. Also unlike the US, many European countries are adopting concrete and binding *energy efficiency and saving measures* (a sensible policy given that reducing on-peak consumption by saving energy can be 75% cheaper than buying it, and is faster and easier than increasing supply). Ironically, Europeans already consume far less energy per head than their American counterparts, showing how much more work the US needs to do in the area of demand management in the face of government estimates for power demand to increase by 22% to 2010 and 50% to 2025[9].

	US	EU-15
Gross Inland Consumption / GDP *(toe*/€90M)*	396	231
Gross Inland Consumption *(toe*/inhabitant)*	8.3	3.8
Electricity generated *(kWh/inhabitant)*	14 323	6 725
Electricity in final energy consumption	21.4%	19.4%

Source: 2001 Annual Energy Review (EU) (1999 figures)
** toe = tonne of oil equivalent, or 10^7 kilocalories, or 41.86 GJ*

4. WAYS FORWARD

29. What, then, needs to be done to ensure both *security of supply* in future, rectifying the transmission problems, and *adequate generation* to cope with ever increasing demand? Some argue that the power cuts of 2003 represent mere teething problems in the introduction of a market based system. If the free market is left to its own devises, weaker players will be weeded out, allowing prices to rise and profits to recover to a level which will ensure proper infrastructure investment. In the UK, for example, it is estimated that the industry will consolidate down to four or five key players that both generate electricity and supply the regional networks. Meanwhile, wholesale electricity prices are starting to rise on the expectations that weaker players will soon be forced out. This rebound is seen as proof that this "price-crisis" is a simple case of the forces of supply and demand at work. Rising prices also have an effect on the reserve power front, giving firms the incentive to invest. Reserve capacity is therefore slowly beginning to increase again.

30. Market forces certainly have ensured much needed improvements in the European system, and have delivered lower prices. However, it seems that they have pushed existing infrastructure to its limits, and that infrastructure investment is now required to satisfy future demand. The market may indeed deliver this eventually, but volatility in prices and insecurity of supply, as experienced during

[8] See European Commission Communication on European Energy Infrastructure, 2001.
[9] EU consumption is estimated by the Commission to rise 2% a year between now and 2020.

2003, may have to be endured in the meantime. The recent power cuts demonstrated such risks, and tested the reaction of consumers, businesses and politicians alike. Some government intervention seems necessary.

31. The reaction to the blackouts in the US has been legislative, with the *Energy Bill* finally due to be passed in 2004, representing the first comprehensive energy legislation since 1992. This legislation, designed to upgrade the national grid system and make it more reliable, will not solve all the industry's problems, but it will help to remedy the causes of the August 2003 power cuts. For example the voluntary industry electricity reliability rules (set after the New York power cut of 1965), which were violated by operators in the Midwest, are set to become compulsory. As well as streamlining the permit process for transmission facilities, the Federal Regulator (FERC) will be given limited authority to site these facilities in national interest electric transmission corridors if states cannot or will not act. The bill removes the barrier to non-utility companies buying utility firms, (through the repeal of the Public Utility Holding Company Act), which should lead to much needed investment. This will be promoted further through tax provisions (such as reducing the depreciable life and sales tax on transmission assets). Energy efficiency is also encouraged, including through tax credits for energy-efficient new homes and offices. Funding and other provisions should also promote a stable and diverse supply of fuels for electricity transmission (e.g. federal funding for clean coal initiatives, tax incentives for decommissioning nuclear power plants, improving licensing conditions for hydroelectric plants, incentives for more natural gas production etc.).

32. What about European legislation? Has the 'managed liberalization' of the market worked? Are the current EU Directives, which are to be implemented by mid-2004, sufficient, or is further legislation required?

33. One area that the recent power outages has shown to require further attention is the role of the TSOs (Transmission System Operators). Even before the blackout in Italy, there were well known issues facing TSOs in Europe, ever since the unbundling of grid activities from the production and trading of electricity (so that they no longer have direct influence over the location of generation). Their responsibilities need to be clarified, and their industry bodies (the UTCE and ETSO) have long been calling for a regulatory framework outlining their role. A binding code at EU level for TSOs on the technical performance of the grid and generation units connected to it could be considered. UCTE is attempting to remedy shortcomings in transmission system control on the part of individual TSOs and the lack of co-ordination of commercial activities among its members in the electricity market, by preparing a multilateral agreement and an operational handbook of management provisions and standards for better congestion forecasting and handling.

34. Measures to strengthen cooperation across countries are also needed. On the one hand, some countries have tried to protect their transmission systems by installing power ration control mechanisms on interconnections. These, however, significantly raise the price of transmission, go against the principles and rules of synchronous co-operation and weaken the network capacity as a whole. On the other hand, there have been calls for the European Union to intervene and improve co-ordination of electricity production. Improved data exchange could also be achieved with stronger mandatory rules. Certainly more co-ordination is required to understand the dynamics of the grid, particularly now that physical flows and trade flows are no longer the same (though estimates used by operators to balance supply and demand still use the former for measurements and estimates).

35. In this context, the UCTE (Union for the Co-ordination of Transmission of Electricity) plays an important role. Five of the ten new EU member states are already interconnected and belong to this body. Studies are underway for further interconnections with Turkey, the eastern Mediterranean and eastern Europe. The UCTE's 2003 report on the electricity system adequacy for the 2004-2010 period forecasts that the electricity networks in the 23 countries it presently covers[10] will remain

[10] Austria, Belgium, Bulgaria, Bosnia and Herzegovina, Croatia, the Czech Republic, Denmark, France, Serbia and Montenegro, "the former Yugoslav Republic of Macedonia", Germany, Greece, Hungary, Italy, Luxembourg, The Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain and Switzerland.

reliable in the near future (2004-2006) but that reserve capacity will decrease markedly between 2008 and 2010 unless new investment to increase power generation is undertaken soon. The reliability of the Iberian and Italian power supply is expected to improve along with new investment in plants, whereas Serbia and Montenegro, the "former Yugoslav Republic of Macedonia" and Greece are advised to become better interconnected to protect against looming shortages.

36. The UCTE is also doing very useful work to consolidate and strengthen existing agreements between transmission system operators (TSOs). It has launched the preparations of an Operational Handbook aimed at establishing binding security and reliability rules for participating networks - with the European Commission, European regulators, TSOs outside the UCTE area and other stakeholders also participating.

37. The European Commission has already reacted to some of the failings in Europe's electricity system in 2003, with a new draft directive[11], issued in December 2003, highlighting the *need to promote investment*. Member states will be required to have a clearly defined policy towards supply-demand balance, allowing for targets for reserve capacity to be set. Defined standards will have to be met regarding the security of transmission and distribution networks, and each TSO will have to submit a multi-annual investment statement to its national regulator, with a summary of these investment programmes being submitted to the Commission that is to coordinate a trans-European investment priority list. Regulators will also be able to intervene in order to accelerate the completion of projects. According to the European Commissioner responsible for energy, Ms Loyola de Palacio, the concrete measures on upgrades to some of the key interconnections between EU member states will improve both the competitive framework and security of supply. The current situation, whereby the necessary investment is held up in long disputes on planning issues, cannot be allowed to continue.

38. However, too much legislation also holds its risks. For example, the EU proposal that countries must have 10% connectivity has been heavily criticized, notably by the UK which operates with only 2% interconnectivity and does not have a system which is synchronous with the rest of Europe. The Directive in question, it is argued, would be expensive to implement and increase, rather than reduce, instability. Arguably, the current legislation in Europe gives regulators, authorities and governments a great deal of power to intervene in order to stabilize the market. The focus should be on implementing outstanding EU directives, rather than adding further to regulatory uncertainty which hampers the investment environment. Creating a more positive business environment to allow investment to take place should a priority.

39. Market and legislative responses largely address the problems associated with transmission and are directed towards ensuring the *security of supply*. However, the longer term issue facing Europe's energy sector is to identify affordable, safe and environmentally sound primary sources of energy to ensure sufficient generating capacity. Improving transmission is not a solution in itself, not least since a 10-15% import capacity will be unable to make up for a lack of or mislocation of generation. The EU's current plans for increasing transmission do not necessarily rhyme with basic energy efficiency rules, as it is cheaper to transport oil, coal and gas than to transmit electricity *over long distances* (even if the original source of production is less expensive than potential local supplies). Compensating for any sub-efficient deployment of power plants vis-à-vis the grid could in the end be a waste of money and not technically efficient (for instance as oscillation increases). Authorities in the EU seem to view electricity in the same way as other internal markets, with five or six big players dominating national markets and competing over infrastructure connections and imports. This may work for beer, paper and easily transported products, but not necessarily for electricity.

[11] http://www.europa.eu.int/rapid/start/cgi/guesten.ksh?p_action.gettxt=gt&doc=IP/03/1694|0|RAPID&lg=EN;

40. Attention must therefore be paid to generating electricity in the 'correct place' – i.e. geographically close to demand. What is also important is to guarantee *adequate generation* to prevent future blackouts, ensuring that either sufficient spare capacity for power generation exists or more stringent savings measures are introduced. The question facing Europe over the long term is how to generate this needed increase. Discussions range from increasing gas usage; improving the efficiency of existing energy sources such as coal; revitalizing nuclear energy; or promoting renewable sources. A clear, multinational response to this question will become more urgent as existing infrastructure reaches the end of its life over the next decade.

41. Yet it will be extremely difficult to generate enough and reliable energy supply in whatever form if consumption patterns remain on their current growth path. Making the 'green agenda' have a genuine impact on the everyday life of each European citizen by *optimising energy consumption* must therefore be the ultimate solution. Luckily, this is recognized by the European Commission in its latest draft directive[12], which proposes that EU member states reduce energy consumption by 1% each year through boosting energy efficiency (leading to around 6% annual energy savings in 2012). Potential energy savings that can be reached without affecting living standards or output are estimated at between 15 and 35% in the European Union, with even higher savings possible in non-EU countries in central and eastern Europe.

5. CONCLUDING REMARKS

42. In conclusion, the series of power cuts in 2003 should be taken as a wake up call, reminding us of the vulnerability of our European power systems, and the potential devastating effects of any total blackout. Europeans should consider themselves lucky that the integrated system did not fail completely in summer 2003 and consider this luck as an admonition to tackle existing problems as outlined in this report. The risk of further cuts can be reduced if the new challenges posed by liberalization are timely and properly addressed. A combination of improvements in the transmission network, generation capacity, demand management and investment allocation are all required to ensure true security of power supplies in future. Adequate investment and regulation in electricity market are essential to a smooth functioning of modern economies.

43. The Rapporteur acknowledges that strategic decisions of many European countries to open up their energy markets to foreign participation have far-reaching implications. If the ultimate goal is to widen consumer choices and enhance competition, the transitional phase will test network co-ordination capacities which, as we have seen, were strained to the limit and failed on a number of occasions last year. The coming together of western and central European electricity networks following EU enlargement will represent another challenge. In a departure from the traditional approach to regulation - in which comfortable investment levels were maintained to ensure plentiful supply of power at all times - players in a liberalised market will be more attentive to cost/return indicators and hence will tend to create a leaner, but, we hope, still reliable system.

44. It is in conclusion important to stress the following needs:

i. The speedy implementation of current EU directives, as well as support for the EU's latest legislative proposals, and a drive towards a fully open but properly regulated market.

ii. Continued investigation into the role of Transmission Systems Operators, with a view to improving real-time data sharing and co-ordination.

iii. The efficient co-ordination of system operation through an independent and suitably located body with long-term experience in this field should be considered. Locating the European Centre for Technical Co-ordination of European Transmission Systems and Cross-Border

[12] http://www.europa.eu.int/rapid/start/cgi/guesten.ksh?p_action.gettxt=gt&doc=IP/03/1687|0|RAPID&lg=EN

Trade in Prague is one option, due to its solid experience in co-ordinating the former synchronously operated "MIR" system that used to group Czechoslovakia, the German Democratic Republic, Poland, Hungary, Romania, Bulgaria and the USSR.

iv. The promotion of transmission system and generation investment, though a stable regulatory environment and fiscal incentives.

v. Continued efforts to manage electricity demand, to eliminate price distortions and to promote energy efficiency programmes.

vi. The diligent application of existing security and reliability standards by national transmission system operators and a further harmonisation of technical and administrative rules for interconnectors as proposed by the Union for the Co-ordination of Transmission of Electricity.

vii. Further revision of the EU guidelines for the Trans-European Energy Networks in order to better integrate the new member states and neighbouring countries into the wider energy market.

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