Lessons that should be drawn from the recent incidents in electricity supply and suggestions for guaranteeing an adequate electricity supply in liberalised markets

CEER believes that rather than jumping to premature conclusions these events should be analysed carefully to identify not only the immediate cause of the disruptions but also any underlying structural problems that might have contributed to the incidents.

Generation capacity has been scarce in some cases; in other cases it has been utilised inefficiently. Insufficient transmission capacity has contributed to supply disruptions in some cases and should be enhanced quickly, particularly at interconnections. System operation procedures should be improved with special attention being given to inter - TSO coordination and cooperation. In some instances control systems should be modernized to utilize technical advances. At the same time emergency and restoration plans need to be revised and periodically reviewed to assure rapid restoration of services in cases of disruption.

Liberalisation requires a clear definition of duties and responsibilities among actors

Security of supply has a cost. The process of liberalisation has introduced transparency in all cost components. Transparency allows for a better understanding of the issues. The challenge before us is to exploit all possibilities of improving the trade-off, i.e. the possibilities of reducing risk without any cost increase or reducing the cost of energy without any risk increase. This is possible in many cases, as inherited systems are rationalised. A well designed liberalisation and effective regulation can produce the desired rationalisations.

1. The events

An unusual series of incidents in electricity systems has been experienced in the recent period.

In two cases there has been a blackout, with loss of control over the grid and cascading disconnections spreading on a very large area: on August 14 in some Eastern states of the US and on September 28 in Italy. In the former case the g id was overloaded, while the latter accident happened at a time of minimal consumption, so that the unbalance was initially concentrated on the interconnections with the Swiss and the French systems. In both cases, over 50 million consumers were disconnected for several hours .

In Norway, exceptionally dry years resulted in a fall in hydro generation during the 2002-2003 Winter. Demand could not be met by internal generation and, although the traditional export flow was reversed and imports grew to the limit of the interconnections, domestic prices skyrocketed. Price variations were effective in restraining demand and no outage was necessary.

Very high prices were reached on the French power exchange in January, due to a peak in domestic demand.

An exceptionally hot 2003 Summer has set European electricity systems under strain, making imbalances more likely, as a result of exceptionally high demand and limitations on thermal generation due to a reduced capacity of cooling systems. Emergency conditions were met in southern Spain during June, but no demand shedding was necessary. Price peaks indicated imbalance conditions in France during August. On June 26, planned outages were applied in Italy to millions of customers. Fires hit the Portuguese transmission grid on August 2, and half a million customers were disconnected.

A large disruption in transmission lines was experienced in Sweden on September 23: 2 million customers were disconnected.

Large disruptions may have an impact on neighbouring systems: Denmark was affected by regional crises.

Two local loss-of-supply incidents were experienced in Britain on August 14 and September 5, both originating from malfunctioning of equipment on transmission grids, without any connection with excess demand on the system. In both cases outages were for less than one hour, and affected about 400 000 and 200 000 customers respectively.

These episodes, although serious as a whole, can be traced back to very different causes and produced very different outcomes: yet they are also inmost cases the result of some structural weaknesses, which are also very different. The weakness may concern the adequacy of generation capacity, the adequacy of transmission and distribution grids, management procedures and behaviour, including the insufficient level of coordination among various operators in the same country and among different system operators; it is also possible that some role has been played by an incomplete allocation of tasks and responsibilities in newly created and more unbundled, complex liberalised systems.

The analysis of large disturbances in electricity supply in liberalised markets requires an integrated approach which includes consideration of at least the following components: adequacy of generation capacity and of the grid, including interconnections among systems; methods of system operation; emergency and restoration plans; organisational issues and institutional arrangements.

a) Generation capacity

Only in some cases has insufficiency of generation capacity emerged as a cause of crisis. The issue cannot be clearly isolated from the similar issue regarding transmission capacity, since generation in one system and interconnection with other systems are obvious substitutes. Insufficient reserve margins may derive from insufficient investment or by existing capacity not being made available when needed.

In a liberalised context investment decisions are directly affected by expected profits, and inversely affected by the degree of uncertainty of such expectations. Long-term projects are penalised in a context where short-term profitability dominates company choices.

Revenue expectations for new investments not only depend on market mechanisms, but also on the stability of the regulatory regime, including market opening, tariffs harmonisation, access to the grid and environmental legislation.

In the initial stages of restructuring, liberalisation and regulation may be unable to provide sufficient incentives for investment projects; particularly for investment in plants designed for working only a limited number of hours such as peaking plants. During the transition phase towards full liberalisation, uncertainty regarding important aspects of the future setting may be large, so creating an obstacle to investment decisions.

Distributed generation can play a role in mitigating electricity crises through peak-shaving and reduced strain on the grids, particularly where generation from renewable sources is developed.

b) Transmission capacity

Transmission capacity, especially interconnection tie lines is in general insufficient in several areas of Europe, so that separate regional markets exist rather than an integrated European market. As a consequence, incidents which have been determined by insufficient regional generation could have been prevented if better interconnections had been available. To that matter of course, the planning and operational security issues (e.g. stability, etc.) will have to be revisited and examined carefully, as it is already planned by the stakeholders in charge like UCTE.

A growing interconnection level among neighbouring Countries helps to reduce the reserve margin, increases grid stability and provides mutual assistance during system emergencies.

Transmission capacity includes not only the amount of physical infrastructures but also the quantity and quality of telematic instruments for control and management.

c) System operation

In most cases problems arose not from insufficient investment but from operational problems.

An accurate analysis of the recent incidents and confrontation of experiences in various countries may help greatly in identifying possible improvements.

A more effective co-operation between TSOs at the regional level is necessary to manage incidents involving connected grids, through improvement of short term operational planning as well as real time operations.

d) Emergency and restoration plans

The importance of emergency plans can be underestimated during long periods of routine functioning of a system without incidents.

Technology improvements are possible, both for preventing incidents and for limiting their spreading.

e) Organisational issues and institutional arrangements

An appropriate allocation and sharing of responsibilities among all actors involved in the management of the electric system is fundamental. This task is certainly more complex and difficult in a liberalised context, where market players have a major responsibility in the proper fulfilment of their contractual obligations, with effects on the whole system. Indeed here lies one of the main challenges facing liberalisation.

Institutional arrangements in various countries present a wide range of different approaches in assigning responsibilities with respect to security of supply. A prevailing pattern can be outlined as follows:

– governments have the power and responsibility to define the general security of supply policies and goals;

- regulators are responsible for the operational monitoring and for setting up the appropriate market arrangements, definition and approval of the grid codes and other market rules and arrangements;
- TSOs and DSOs (in some countries also other market participants) are responsible for the short term security of operation, as defined in the rules provided by the regulators.

2. Proposals

New investment in generation is needed, with different urgency in various electrical systems. Markets provide a satisfactory answer when effectively working and competitive: in many electrical system this is not, or not yet, the case. Therefore the situation must be monitored so that sufficient capacity, including peaking units, is available and reserve margins are adequate. Promotion of new investment may be necessary: in this case, market methods should be employed for such promotion. Investment incentives should reflect the economic value of additional investment.

At all times, adequate short-term reserve margins should be available to the TSO for its operations. Adequate margins should be clearly defined, with special attention to the characters of the specific electricity system such as the mix of primary energy sources and other physical aspects, and the amount of interconnection available with neighbouring systems.

Investment should be promoted in transmission capacity, as well as in transmission maintenance activities, with the aim to secure adequacy of electricity supplies: since such activities are usually exercised in monopoly, primary responsibility lies on the TSOs, under appropriate regulation.

TSOs should be truly independent from all market actors.

In each country it should be very clear who is entitled to take immediate action in case of a crisis, and who may decide sanctions against operators in case of an abusive behaviour.

The context defined by the new European Directive and Regulation allows greater transparency and a clearer allocation of responsibilities.

Cooperation and coordination among TSOs is essential and should be improved: it could often prevent problems from degenerating into emergencies and avoid complicated and costly solutions to solve them.

Each TSO should have the operational responsibility of collecting the relevant information regarding the electric system: detailed availability of power plants, of grid capacity including interconnection, interruptible customers, contingency plans for mandatory curtailment, forecast of generation capacity and demand. As much information as possible should be readily available on a website, in order to allow an early detection of a potential crisis by the TSO, the authorities and market participants. Public authorities (regulator and government) should have access even to commercially sensitive information, if necessary.

Particular loss of supply problems should be analysed and their causes investigated impartially. Solutions are more effective if market-based.

Volatile electricity prices are an alternative to physical shortages. The working of a free wholesale market can provide the necessary flexibility to the system; it is important that contractual and financial instruments for shielding large consumers from the economic risk of price volatility are available, and that small consumers who are unable to use such instruments are adequately protected.

Grid expansion and reinforcement projects are often delayed by lengthy licensing procedures and local resistance against new lines. For the problem of lengthy licensing procedures, a co-operation with, and possibly some initiative by, the EU Commission would help. Resistance against

the new lines can only be overcome via in-depth understanding, and detailed and careful negotiations involving all parties. New developments in technology, such as new cables or even gas-insulated lines, can remedy some specific situations; nevertheless, from the environmental perspective and especially in order to foster the development of distributed generation, a strong grid with adequate transport capacity is mandatory.

Contractual measures should provide an amount of load which can be interrupted, instantaneously or on a predetermined notice. The economic value of interruptibility should be related to the economic value of reserve, and determined via market processes.

Energy saving initiatives will help to restrain the growth of demand. More relevant to the issue of avoiding and managing incidents are initiatives on the demand side which can reduce peaks and shift the load to off-peak hours.

Some governments have, in response to the events described, introduced temporary measures concerning emergency measures, such as temporary and limited derogations from environmental constraints regarding power stations, and discharge temperature for cooling water and quantity limits for air polluting emissions. Such measures will be most effective and consistent with the liberalized market where the circumstances for their exercise are clearly set out in advance.

3. Initiatives by the CEER

A specific working group is active. It collects information from CEER members on national experiences and initiatives, prepares a list of existing or desirable good practices, develops advice for actions to prevent the occurrence of incidents or to mitigate their consequences.

CEER members are looking for an appropriate balance between mandatory obligations and market forces. They believe that security of supply can be best delivered through market based instruments applied to the competitive sections, and through incentive regulation of natural monopolies. Investment can be brought forward by appropriate price signals and organised markets, and appropriate responsibilities and incentives regarding network maintenance and operation can be placed on TSOs.

The CEER actively participates in the development and definition of the new UCTE Operational Handbook.

The CEER supports any initiative for publication of relevant information according to agreed, standardised formats at national and EU level.

Cooperation among regulators and TSOs should be increased and strengthened, and the CEER will operate in this direction.