Towards Voltage Quality Regulation in Europe -

An ERGEG Conclusions Paper

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Executive Summary

Voltage quality (VQ) represents the usefulness of electricity for final customers. Voltage quality disturbances (like voltage dips) can be as harmful as interruptions for some customers. For some industries these kinds of disturbances can represent a serious cost. Voltage quality is becoming an important issue in many countries because of the sensitivity of end-use equipment and the increasing concern of all interested parties, especially network operators, electric products manufacturers and final electricity customers, of a possible deterioration of the VQ due to long time effects of deregulation.

Productivity and competitiveness in both manufacturing and service industries depend increasingly on quality of electricity supply. Liberalisation in electricity markets is expected to provide market prices, but quality still relies upon network operators' investments and operations, which are under regulated regime.

Voltage quality is described through a set of relevant technical parameters. At European level the most important technical norm defining electricity as a product is the European standard EN 50160, issued by the European standardisation body for electricity, CENELEC, which defines different VQ parameters and gives some limits.

It is important to revise the EN 50160 standard because:

- It reflects the lowest quality levels throughout Europe, rather than the average or the best levels.
- It does not provide long term incentives to promote voltage quality in networks.

For both these reasons most of the limits set in EN 50160 are no longer adequate for electricity customers. Especially non-binding indicative values must be revised as they are outdated. Nowadays customers require a full description of the parameters and levels of VQ of electricity and not wide range limits as in the present EN 50160.

The European Regulators Group for Electricity and Gas (ERGEG) published the public consultation paper: "*Towards Voltage Quality Regulation in Europe",* in December 2006. This document analysed today's voltage quality limits and values in Europe, mainly related to EN 50160, overviewed cases of voltage quality regulation and monitoring within EU Member States and made recommendations to CENELEC for revising EN 50160. Ahead of issuing this document there was dialogue with CENELEC. Following a meeting in May 2006, a technical workshop took place in Milan in September 2006.

ERGEG put forward seven recommendations in the public consultation paper presented to CENELEC and other stakeholders as input to the revision of the EN 50160:

1. *Improve definitions and measurements rules:* It is important to avoid ambiguity as much as possible. Many parameters still need to be better defined.
2. *Limits for voltage variations:* Currently, many limits of voltage are given in relation to 95%-of-time. In order to protect customers it is important to avoid this clause, and limits should refer to 100% of "normal operating conditions", which already exclude a long list of events "out of control" of the network operator.
3. *Enlarge the scope of EN 50160 to high and extra-high voltage systems:* EN 50160 is only applicable to networks up to 35 kV.
4. *Avoid ambiguous indicative values for voltage events.* No binding limit is provided for interruptions and dips, only vague "indicative limits". A preliminary step is to introduce a classification of dip/swell severity.

5. *Consider duties and rights for all parties involved:* Responsibilities between equipment and network could be separated through a good classification. This requires coordination with technical standards for appliances.
6. *Introduce limits for voltage events differentiated according to the network characteristics*: The present EN 50160 provides only indicative values, generally through wide ranges (for instance: between a few tens and one thousand per year for dips, between a few tens and several hundreds per year for short interruptions). Actual levels are largely better than those provided for in EN 50160.
7. *Power quality contracts*: Guidelines could be developed in order to help customers and network operators to apply this tool in practice to real situations.

During the Public Consultation, ERGEG received 27 written responses, more than half coming from utilities or utility associations (14) and a good fraction coming from VQ professionals, single experts, academics or research institutes (11). Only one response came from the customers' side and two from manufacturers or other interested parties (equipment producers, solution providers). All responses received are publicly available on the ERGEG website (www.ergeg.org). A synthesis of the comments received is publicly available as well.

After the publication of the ERGEG public consultation paper, a dialogue has started between CEER and CENELEC for revising EN 50160. This process is still ongoing and results are not finalised. However, it is clear from both the consultation process and the dialogue with CENELEC that the voice of final customers (household and business customers, especially industrial ones) is not adequately represented. Consequently, knowledge about benefits for customers of new VQ limits is still limited and therefore costs can be overestimated with respect to benefits for final customers.

With this Conclusions Paper ERGEG wishes to pursue the process already started with CENELEC; hence it is only necessary to state here the basic principles.

After this Public Consultation, ERGEG supports the following principles:

- some definitions, especially for voltage events like dips/swells and interruptions, should be improved in order to get comparable measurements all around Europe;
- indicative values for voltage events should be avoided in the text of the EN 50160 norm, they can form the content of informative annexes or technical reports instead;
- binding limits for voltage variations should be also targeted to customer protection and therefore the 95%-of-time clause should be reconsidered;
- the scope of a VQ standard should be larger than the actual EN 50160 scope; the HV-EHV networks should be included and also the concept of "normal operating conditions" should be clarified;
- product standards should also be reconsidered where appropriate in order to give correct signals to customers when they make their choices on the electrical products.

In order to transform those principles in concrete actions, this position paper sets out ERGEG's view on the "road map" to arrive in a reasonable time to new largely acceptable VQ standards, also suitable for regulation purposes. The implementation of VQ monitoring systems and the dissemination of statistical data among regulators, customers, network operators, equipment manufacturers and research centres will improve greatly the knowledge and customer awareness about VQ issues.

Possible actions of the European Commission would be to promote and harmonise the national activities in the VQ area. In particular, labelling electrical products according to their voltage quality class and funding research on VQ in the liberalised environment could be important initiatives.

1 Introduction

1.1 Background and purpose of this paper

1. Both the liberalisation process and the privatisation of electricity network operators pose new challenges for securing quality of supply. The customer satisfaction will crucially depend upon, among other things, the continuity of electricity supply and the provision of voltage quality levels adequate to the needs of customers.

2. Voltage quality (VQ) is the usefulness of the electricity for final customers, when there are no interruptions. Voltage quality disturbances (like voltage dips) can be as harmful as interruptions for some customers. For some industries these kinds of disturbances can represent a serious cost. Voltage quality is becoming an important issue in many countries, because of the sensitivity of end-use equipment and the increasing concern of all interested parties, especially network operators, electric products manufacturers and final electricity customers, of a possible deterioration of the VQ due to long time effects of deregulation.

3. Voltage quality is described through many parameters. At European level the most important technical norm defining electricity as a product is the EN 50160 norm, issued by the European standardisation body for electricity, CENELEC, which defines different VQ parameters and gives some limits and indicative values. Many other technical standards, belonging to EMC series (IEC 61000 series, which apply also in Europe) are relevant as well for voltage quality measurement procedures and standards. In this paper we use the word *norm* for international/national norms from standardisation bodies, and the word *standards* for regulatory standards stated in regulations.

4. ERGEG published the public consultation paper: *Towards Voltage Quality Regulation in Europe – An ERGEG Public Consultation Paper* (hereafter: The Consultation Paper) in December 2006. Ahead of issuing the Consultation paper regulators met with CENELEC. Following a meeting in May 2006, a technical workshop was held in Milan in September 2006 which assembled VQ experts from several European countries.

5. The consultation paper analysed today's voltage quality limits and values in Europe, mainly related to the standard EN 50160, overviewed cases of voltage quality regulation and monitoring within EU members states and made recommendations to CENELEC for revising EN 50160. It invited views from interested parties regarding these issues.

6. This Conclusions Paper considers the views received during the ERGEG public consultation process and proposes next steps for reaching results within a reasonable time. It restates ERGEG's recommendations regarding the VQ standards' framework in the light of submitted views and of the steps made so far in the dialogue and collaboration with CENELEC.

7. ERGEG follows with interest the development of the revision of VQ standards and will determine if this is adequate to customers' needs taking into account experts' advice and stimulating customer associations to participate actively in the revision process.

8. ERGEG also intends to use this Conclusions Paper as a basis to advise the European Commission in the light of revision of EC Directives for the internal market of electricity, especially for the role of regulators in setting standards for quality issues.

1.2 Recap of ERGEG Consultation paper

9. In the ERGEG public consultation paper, seven recommendations were made to CENELEC for revising EN 50160:

1. *Improve definitions and measurements rules:* It is important to avoid ambiguity as much as possible. Many parameters still need to be better defined.

2. *Limits for voltage variations:* Currently, many limits of voltage are given of 95%-of-time: in order to protect customers it is important to avoid this clause, and limits should refer to 100% of "normal operating conditions", which already exclude a long list of events "out of control" of the network operator.

3. *Enlarge the scope of EN 50160 to high and extra-high voltage systems:* EN 50160 is today applicable only up to 35 kV networks.

4. *Avoid ambiguous indicative values for voltage events.* For interruptions and dips no binding limit is available, only vague "indicative limits". As a preliminary step is to introduce a classification of dip/swell severity.

5. *Consider duties and rights for all parties involved:* Through a good classification responsibilities between equipment and network could be separated. This requires coordination with technical standards for appliances.

6. *Introduce limits for voltage events differentiated according to the network characteristics*: The present EN 50160 gives only indicative values, generally through wide ranges (for instance: between a few tens and one thousand per year for dips, between a few tens and several hundreds per year for short interruptions). Actual levels are largely better than those stated in EN 50160.

7. *Power quality contracts*: Guidelines could be developed in order to help customers and network operators to apply this tool in practice to real situations.

1.3 Responses received

10. During the Public Consultation, ERGEG received 27 written responses to the consultation paper. More than half coming from utilities or utility associations (14) and a good fraction coming from VQ professional, single experts, academics or research institutes (11). Only one comment came from customers' side and only two from manufacturers or other interested parties (equipment producers, solution providers). Submissions came from 14 different countries: Italy (5), Hungary (4), Norway (2), UK (2), Austria, Belgium, Czech Republic, France, Germany, Ireland,

The Netherlands, Portugal, Slovenia, Sweden and the USA (one each). Further, three responses came from international bodies.

11. Despite the vast participation by utilities and their associations, only one response was submitted from the customers' side and only two from manufacturers or other interested parties (equipment producers, solution providers) therefore ERGEG does not consider that the collected responses span the whole structure of the EU electricity market.

12. The respondents were :

A) Utilities and utility association

- EURELECTRIC - Union of the electricity industry (EU)
- GEODE - Groupement Européen des enterprises et Organismes de Distribution d'Energie (Association representing energy distributors in Europe)
- CSRES - Czech Association of the Regulated Power Supply Companies
- EBL - Norwegian Electricity Industry Association
- VEO - Association of Austrian Electricity Companies
- VDN - Association of German electricity network operators
- SYNERGRID, Fédération des gestionnaires de réseaux Electricité et Gaz en Belgique
- Energy Networks Association (UK)
- Hungarian Electricity Association
- EON North Transdanubian Electricity Co. (utility, Hungary)
- Démász Hálózati Elosztó Kft (utility, Hungary)
- ENEL Distribuzione (utility, Italy)
- E.ON Hungária Zrt. (utility, Hungary)
- ESB Networks (utility, Ireland)

B) Customer associations

- The Association of Norwegian End-users of energy

C) Experts, academic and research institutes

- Hervé Rochereau, - EDF Research and Development (France), chairman of Cenelec TC 8X
- M.H.J. Bollen, STRI AB (Sweden) and Paola Verde, University of Cassino (Italy);
- CIGRE/ CIRED/ UIE Joint Working Group C4.110 (convenor: Math Bollen) (EU)
- Dejan Matvoz, Electric Power System Control and Operation Department, Milan Vidmar Electric Power Research Institute, Ljubljana (Slovenia)
- Mark McGranaghan, EPRI (Electric Power Research Institute) (United States)
- V. Ajodhia and B. Franken, KEMA Consulting (The Netherlands)
- Giovanni Mazzanti, teacher of Power Quality at the Faculty of Engineering, University of Bologna (Italy)
- Pierluigi Caramia, Unità di Cassino del GUSEE (Gruppo Universitario Sistemi Elettrici per l'Energia) and Ing. Pietro Varilone, Sezione di Cassino dell'AEIT (Italy)

- Dr Sasa Djokic, Lecturer, School of Engineering and Electronics, University of Edinburgh (Scotland, UK)
- Enrico Tironi, full professor of Electrical Power Systems; Gabrio Superti Furga, full professor of Basic Electrical Engineering – Department of Electrical Engineering, Politecnico di Milano (Italy)

D) Others

- TW_TeamWare (Equipment manufacturer, Italy)
- QEnergia (solution provider, Portugal)

13. All comments received are publicly available on the ERGEG website. A synthesis of the comments received has been prepared and is also published (*ERGEG Public Consultation on Toward Voltage Quality Regulation in Europe - Evaluation of the Comments Received, E07-EQS-15-04*).

1.4 Relevant recent developments

14. Since the publication of the Consultation Paper a number of developments regarding VQ standards have occurred.

Dialogue with CENELEC

15. The consultation paper points out a number of aspects of EN 50160 which need to be addressed and represents an agenda for the review which is currently being undertaken by CENELEC. Regulators participate actively to the work of Working Group 1 (WG1) within the CENELEC Technical Committee 8X ("System aspects"), hereafter CLC TC 8X.

16. Within WG1 of CLC TC 8X, four ad-hoc task forces have been launched in order to explore possible solutions to issues raised by the Consultation Paper. These task forces have the following scopes:

- Voltage dips and swells (TF1).
- Enlarging EN 50160 scope to HV/EHV networks (TF2).
- Limits for supply voltage variations and rapid voltage changes (TF3).
- Long and short interruptions (TF4).

17. The preliminary results are promising, but it is important to take into account the process necessary where the finalised results from the four TFs will be presented to the WG1 as input to the discussions for the final draft of the revised norm. Indeed, it will eventually be submitted for the CENELEC commenting and voting procedures.

Dialogue with VQ technical experts

18. After the publication of the Consultation Paper, Regulators exchanged views about the proposed revisions of the EN 50160 with the CIGRÉ/CIRED/UIE Joint Working Group C4.110.

2 Consideration of responses

19. Respondents to the ERGEG Consultation Paper commented on most of the issues raised. A detailed analysis of the respondents' views is contained in document "*Evaluation of Comments"*, E07-EQS-15-04.

20. In this chapter, principles expressed in the Consultation Paper are re-examined and re-stated not only in the light of the respondents' views but also in the light of the ongoing revision process of EN 50160.

2.1 General issues

21. All respondents supported the initiative of ERGEG of revising EN 50160, arguing that a thorough revision is necessary for a wide number of reasons:

- increased load susceptibility and emission injection into the grid,
- necessity of increased industrial process efficiency and productivity (heavy industry replaced and more sophisticated production methods),
- changes in the last 10 years of electrical system structure and operation, due to active network thanks to distributed generation, whose relevant importance will further increase in the next years,
- changing regulatory framework,
- voltage quality is a key issue for customers, both business and household customers;
- the need to have a better basis for handling disputes and giving information to the customers on VQ issues.

22. Respondents welcomed the dialogue between regulators and CENELEC, though there is some concern about the revision of EN 50160. Such a modification has to be carried out with the utmost caution. In particular, some respondents emphasized:

- External links to be considered, especially collaboration with other working groups and compatibility/consistency of EN 50160 with other existing standards widely used, as the IEC EMC series.
- The cost of investments to be carried out on networks in case of improvement of VQ standards to levels better than those actually available today.

23. As for consistency with existing IEC norms, the ongoing process in cooperation with CLC TC 8X is based on the assumption that no major change in existing EMC (or similar) norms is presently needed.

24. Stakeholders participating to the consultation process were asked their view on the costs and benefits of the new VQ standards. Many changes now under discussion within CENELEC TC8X WG1 do not concern new limits but only definitions and measurement methods or the elimination of vague and/or indicative limits and hence have no impact on costs, but bring the benefit of avoiding ambiguity.

2.2 Voltage events (especially interruptions, dips and swells)[1]

25. There is a general consensus among respondents and regulators on new definitions to be given for voltage events, in particular:

- Change the threshold for distinguishing dips and interruptions from 1% to 5%;
- Give applicable, simple and useful definitions and classifications for both dips and swells;
- Give definitions of voltage dips and interruptions to cover all events in three phase networks;
- It is not feasible to define Europe-wide limits on the number of voltage dips/swells as it would lead to unacceptable levels of quality or to unacceptable costs for most network operators. Hence, reasonable limits on number of voltage dips should be set in close cooperation with local network operators taking into account local circumstances and could be put in a National Normative Annex (NNA);
- Disturbances are not always under the grid operator's control, e.g. extreme weather influence. Hence, responsibilities should be considered when setting limits.

2.3 Voltage variations (especially supply voltage variations)[2]

26. EN 50160 gives limits for supply voltage variations, but present limits are not considered strict enough by ERGEG to secure adequate customer protection. EN 50160 states that voltage can vary around the nominal voltage in a band of +/-10% for at least 95% of time (measured with 10-min integration interval). For LV customers only a 100%-of-time limit is set at +10%/-15% of nominal voltage. Contractual voltage can be used for MV customers but this is not mandatory.

27. The issue of changing limits for supply voltage variations (considering every aspect: percentage of time, deviation from nominal voltage, interval of time for integration of rms values, use of contractual voltage, etc.) has led to many comments in the consultation process.

28. The limits for supply voltage variations are actually under the scrutiny within WG1 of CLC TC 8X where regulators participate. It is ERGEG's view that priorities in revising the EN 50160 voltage variations limits should cover the following:

- The 95%-of-time should be increased to preferably 100%-of time (normal operating conditions): Only rare and small (short) undervoltages can be sustained, and 5% of a week means more than 8 hours – this is too much.
- Retaining the 10 minutes averaging interval implies that it is necessary to set requirements on phenomena hidden by the long averaging time, like swells.
- In the current EN 50160 there is a special treatment envisaged for "long lines" that originally was set for restricted mountain areas in the Southern Alps but

[1] For an elaborated account of the comments by stakeholders during the public consultation see chapter 4.2 of the Evaluation of Comments Report E07-EQS-15-04 published in parallel with the present Conclusions Report in the ERGEG website www.ergeg.org.

[2] See chapter 4.3 of the report mentioned in footnote 1.

then extended to all areas in EN50160. This special treatment should be cancelled; every customer should be treated in the same way in order to assure competitiveness to every manufacturer wherever he is placed.

- For MV business customers (connected at higher than 1 kV voltage level) limits shall refer not to nominal voltage but to declared voltage (i.e. declared voltage must be the mandatory voltage reference for MV customers); this measure implies a twofold benefit: a better network management by network operators and at the same time a higher voltage steadiness for business customers.

In some countries, limits stricter than + 10% exist for the supply voltage variations, and these requirements should be retained as they are beneficial to the customers.

2.4 Scope for the application of EN 50160[3]

29. Although the enlargement to voltage levels higher than MV is welcomed by most respondents, the EN 50160 philosophy cannot be directly copied to extra-high voltage, due to significant technical differences.

30. For HV/EHV, a flexible approach should be adopted, as:

- customers rarely connect their equipment at HV and EHV levels;
- in (almost) all EU Member States the HV (EHV) network performance is addressed in the Grid Code;
- network performance may differ from country to country;
- voltage quality limits for HV and EHV levels should be defined from the system performance point of view (e.g. for benchmarking purposes); HV and EHV limits and requirements should be carefully correlated with the corresponding MV and LV limits and requirements.

2.5 Coordination with product standards[4]

31. There is a general consensus on the need of defining rights and obligations for the different actors. This can be achieved by the mean of "*responsibility-sharing curves*" (or "indicative compatibility curves") between network operators and customers. These curves set limits above which equipment should be immune and below which the number of events should be regulated.

32. Responsibility-sharing curves for undervoltages already exist outside of Europe (e.g. South Africa). It is proposed to use the tests prescribed in IEC 61000-4-11 as a basis for the responsibility-sharing curve for undervoltage events. This document prescribes how to perform immunity tests against voltage dips for equipment.

33. The future EN 50160 should be the key for the coordination of electricity system design and equipment design such that correct function is achieved and damage to equipment is avoided.

[3] See chapter 4.4 of the report mentioned in footnote 1.

[4] See chapter 4.5 of the report mentioned in footnote 1.

3 A “road map” for the revision of EN 50160

3.1 The reasons for the EN 50160 revision

34. Productivity and competitiveness in both manufacturing and service industries depend increasingly on quality of electricity supply. Liberalisation in electricity market is expected to provide market prices, but quality still relies upon network operators’ investments and operations, which are under regulated regime.

35. It’s important to revise the norm EN 50160 because:

- It reflects the lowest quality levels throughout Europe, rather than the average or the best levels.
- It does not provide long term incentives to promote voltage quality in networks.

For both these reasons most of the limits set out in EN 50160 are no longer adequate for electricity customers. In particular, non-binding indicative values must definitely be revised as they are no longer useful. It appears that the customers now require a full description of the parameters and levels of VQ of electricity.

36. In the last decades, many of the industrial customers in most countries of Europe have moved from the traditional heavy industries to industries with more sophisticated production methods with a high penetration of frequency controlled motors, IT-equipment, distributed microcontrollers etc. The growing presence of this kind of industries makes it necessary to keep the higher quality levels for electricity, and increase the level where appropriate.

37. In the following paragraphs, a “road map” is proposed by ERGEG to arrive in a reasonable time to a comprehensive modification of EN 50160 useful for regulatory purposes.

3.2 The ongoing dialogue with CENELEC

38. Technical norms are developed after a very long consensus process involving experts from several countries and representing several viewpoints. When available and suitable, technical norms are the best tools to be used to complement regulations.

39. For an adequate revision of the EN 50160 the ongoing cooperation between the Regulators and CENELEC should be pursued to obtain a reasonable minimum voltage quality framework applicable everywhere in Europe and useful for regulatory and customer protection purposes.

40. Given the status of the ongoing work within CENELEC, ERGEG considers that the revision may be approved by end-2008 after due public inquiry and voting according to CENELEC procedures.

41. ERGEG considers that the structure of the revised EN 50160 should be adaptable to the differences among the European countries. The rationale of the future EN 50160 could be:

- to give harmonized definitions compatible with IEC norms for homogeneous measurements, monitoring, etc.;
- to give homogeneous "*responsibility-sharing curves*" (or "indicative compatibility curves") between network operators and customers, especially for voltage dips and swells, in order to allow a homogenous usage of electrical products all over Europe;
- to avoid vague indicative and non-binding values for voltage events (see 2.3); such values should be left to an Informative Annex or in Technical reports that can be easily updated;
- to set uniform limits for voltage variations and for other phenomena (harmonics, flicker etc), but some countries may have better limits.

42. In principle, ERGEG suggests to leave to every EU Member State (to Regulators and/or to the relevant National Standardisation committee, that could complete the EN) the responsibility for setting binding values at a national level, valid for a single country, but only in case national limits are better for the customer than those stated in revised EN standard. The proposal of NNAs for EN 50160 may give to this standard the normative structure of other EN standards, like EN 50341 and EN 50423.

3.3 Involving customers in the process of revising EN 50160

43. A number of comments received in the consultation process emphasize the need for adequate cost/benefit analysis in revising voltage quality standards.

44. ERGEG agrees that a correct balance between the different perspectives assumed by customers (quality needs and willingness to pay for it), by network operators (the investments needed) and by manufacturers (products requirements) is needed, and therefore the economical equilibrium must guide the work of revision of EN 50160.

45. ERGEG notes that the consumers' views have not been adequately represented in the consultation process and in the CENELEC work (through active participation). This can ultimately lead to underestimation of the benefits of revising VQ norms and/or overevaluating costs that might be incurred by new norms.

46. In order to secure a better representation of electricity customers in the process for revising EN 50160, ERGEG recommends to CENELEC to take extra effort in order to involve electricity customers' associations in CENELEC committees and working groups.

3.4 Cost/benefit analysis

47. Many respondents to the Consultation Paper raised the issue of economic effects of changing the limits given by EN 50160. On the other hand, as pointed out in the previous paragraph, the benefits could be underestimated due to the non active participation of an important class of stakeholders i.e. customer associations.

48. ERGEG underlines that out of the four points of the rationale for revising EN 50160 (see above point 41), only the last one can have some consequence in terms of costs sustained by network operators, as far as supply voltage variation limits were to be improved in respect of current ones. There will be no impact on costs due to new definitions or to the exclusion of indicative values from the future EN 50160.

3.5 Learn from VQ monitoring systems and exchange ideas with independent VQ experts

49. In the recent years, many VQ monitoring systems based on IEC 61000-4-30 measurement rules have been implemented in some European countries. The data collected by these systems, especially the most significant, in terms of statistical relevance, as number of buses monitored, time of observation, etc., shall be used in order to have an updated picture of VQ levels in Europe. To make this picture as complete as possible, the installation of new monitoring systems in the countries that currently do not have any, and the improvement of existing systems should be promoted.

50. The implementation of VQ monitoring systems and dissemination of statistical data among regulators, customers, network operators, equipment manufacturers and research centres will improve greatly the knowledge about critical issues.

51. For a deep analysis of the data collected by monitoring systems, and also for a better understanding of the very technical issues related to VQ, the collaboration with experts, both from universities and research centres, should be improved. This can be achieved also by the mean of a stricter cooperation with international research groups already active on the subject (e.g. CIGRE and CIRED study committees).

3.6 A role for the European Commission

52. Possible actions of the European Commission would be to promote and harmonise the national activities in the VQ area. In particular, the issues explained in the following paragraphs could be addressed.

53. The possibility of a sort of “VQ LABEL” for electrical equipment could be investigated. The approach to be adopted could be similar to the one used for labelling electrical products with regard to their energy efficiency. In the case of VQ, classes of equipment based on their capability of “riding through” undervoltage events as voltage dips are already in place (see specific product standards and general product standards, like the EN 61000-4-11 and the EN 61000-4-34). Such a product label could refer to these existing classes, or even to an extended number of classes.

54. A better behaviour in case of voltage events could be achieved with limited incurred cost for many kinds of appliances. Especially for industrial machinery, “VQ labelling” could lead to a general reduction of sensitivity of critical loads by enabling the industry to choose the appropriate equipment at the design level. Such a label will also make evident to the customer that a given appliance actually may/will fail in presence of a given voltage event exceeding the class’ withstand-ability. Together with a possible provision of the expected number of events per year per single country, the customer will have a sound technical base for deciding which further protection measures may be needed.

55. As the regulation of VQ shall rely on a sound technical base, a suitable research activity on the relevant topics is needed. This research activity should be coordinated at a European level, by means of European research projects. The currently active Seventh Framework Programme for Research and Technological Development (FP7) administered by the European Commission (DG Research) could be used to achieve the above described goal. In particular, themes related to VQ in the liberalised environment should be emphasized.