Electrocution of Birds – Proceedings of the Congress held in Muhr am See, Bavaria (March 31 - April 2, 2006)

Introduction and Summary

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1. Introduction

Bird electrocution on medium-tension power poles is a world-wide problem. Although this problem had been known for more than 100 years, ill-constructed power poles ("killer poles") still prevail world-wide and keep increasing in number. The most common, highly dangerous types of "killer poles" are metal or concrete pylons with pin-type insulators on top of the crossarm. Many species of large birds are severely threatened or their distributions are strongly affected by "killer poles". These pylons were constructed without caring about bird safety. Technical alternatives, which are safe for birds, always existed, and the world-wide "killer pole" problem should never have reached such a discouraging magnitude. Fortunately, some utilities were cautious enough to avoid "killer poles" in their power lines, with the added benefit of fewer outages.

The world-wide trend of "killer poles" increasing in number has not been reversed but in a few countries. One of them is Germany, where the NGOs, in particular the NABU working group 'Birds and Powerlines', had been active for the last 35 years. The large and continuing effort was rewarded by a number of successes, as sumarised below. The working group always pursued a good balance between urgently needed research, public information, political work, improvement of technical standards, and progress in legislation. At the beginning, there was virtually nothing to start from. Because very little is known about the activities of the working group, this introduction is used to inform the reader about the efforts and achievements reached so far.

Milestones

1974: Start of a public campaign against "electric chairs for our large birds", which had to be continued for many years. NABU working group "Birds and Powerlines" headed by Dr. med. Dieter Haas immediately receives wide public support.

1980: Ökologie der Vögel (Ecology of birds) publishes a special issue on electrocution and collision on powerlines. This important publication is still valid today.

1986: First issue of the VDEW Construction Guidelines for new power poles and for retrofitting/mitigation methods to be applied on existing, highly dangerous power poles. New poles must be safe for birds by design.

1987: Voluntary agreement of the electric utilities to stop the construction of new "killer poles" and to retro-fit existing dangerous pylons.

1991: VDEW Construction Guidelines are improved and re-issued as issue 2.

1992: Progress with the voluntary agreement was too slow. Therefore, the state of Baden-Wuerttemberg determined, that (1) all new power poles must be safe for birds, and that (2) the retrofitting/mitigation of existing dangerous pylons must be in accordance with the VDEW Construction Guidelines (1991) and must be completed within 8-12 years.

2002: The Bonn Convention (CMS = Convention on Migratory Species) adopts the recommendations elaborated by the NABU working group. The recommendations include construction guidelines similar to those of the VDEW Construction Guidelines (1991). The CMS brochure is already available in 6 languages.

2002: The German Nature Conservation Law is amended by §53 "Bird Safety on Powerlines". The law strongly draws from experience in Baden-Wuerttemberg, and requires that all existing dangerous pylons must be made bird safe in accordance with the VDEW Construction Guidelines (1991) within a time span of 10 years.

2003: The NABU working group compiles a report for BirdLife International (D. Haas et al: Protecting Birds from Powerlines), which was used to elaborate Recommendation No. 110 (2004) of the Bern Convention. This recommendation is presented to the Bern Convention (Standing Committee of the European Council) in December 2003. The report is available in German and English under www.birdsandpowerlines.org .

2004: After one year of review, Recommendation No. 110 (2004) is adopted by the Bern Convention in December 2004.

2006: NABU Working Group "Birds and Powerlines" and the Bavarian Society for Bird Protection (LBV) organise the congress "Birds and Powerlines" in Muhr am See/Bavaria (March 31 - April 2, 2006). The Muhr-Congress became necessary, because local agreements were made and §53 was freely interpreted, both in open conflict with the intent of §53 of the German Nature Conservation Law. Also the state-of-knowledge from ornithological side had significantly increased and urgently required an update since the last major publication in 1980.

This impressive series of important milestones was only achieved, because of the wide support from virtually all sides and disciplines: bird watchers, specialists from other working groups ("peregrine falcon", "white storks", "birds of prey", "owls"), NGO's, ministries, and quite significantly also from the technical staff and managers of some utilities. This support is gratefully remembered.

Another reason is the fact, that the NABU Working Group "Birds and Powerlines" always remained strictly independent and self-funded, and that it consequently pursued progress, both, in technical standards and in legislation at the highest possible level.

2. Summary

During the preparation and after the Muhr-Congress, we received so much valuable information and contributions that we decided to incorporate most of it in these "extended" proceedings of the Muhr-Congress. Due the complexity of the subject, the contributions are organised in seven main chapters (blocks).

Block 1: Legislation and International Agreements

Chapter 1.1 and 1.2: These two papers (by W. Boehmer and E. Rademacher) deal with §53 German Nature Conservation Law (2003). One explains the legislative intent, the other one deals with implementation aspects on state level. In §53 the precautionary principle is applied by requiring that:

- all new pylons must be bird safe by design;
- all existing pylons of dangerous construction must be made bird safe within 10 years (by 2012);
- VDEW Construction Guidelines (1991) shall be used.

Both authors come to the conclusion, that an implementing ordinance would ease the enforcement.

Chapter 1.3: The third paper (by M. Nipkow) deals with the international agreements within the Bonn Convention and the Bern Convention. In September 2002, the "Birds and Powerlines" working group of NABU (German BirdLife partner) compiled detailed guidelines for bird safety on powerlines for a resolution, which was adopted by the 7th Conference of the Parties of the Convention on the Conservation of Migratory Species of Wild Animals (CMS). Resolution 7.4 on "Electrocution of Migratory Birds" was signed by the delegates of more than 80 states from all over the world, being members of the so-called Bonn Convention.

In 2003, NABU and its BirdLife partners submitted recommendations for bird protection on power lines to the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). In December 2004, this Standing Committee adopted Recommendation No 110 (2004), which does not only cover electrocution, but also collision and detrimental effects on habitats. The Bern Convention comprises 35 signatory states.

Chapter 1.4: The fourth paper of this block was presented by W. Breuer/ European Group of Experts EGE Owls and discusses the European Wild Birds Directive 79/409/EC, issued in 02 April 1979. The author arrives at the conclusion, that this European community law has not been sufficiently exploited and used to its full potential in the past. §53 of the German Nature Conservation Law is only an overdue response to the Wild Birds Directive in dealing with the specific problem of electrocution. Also Recommendation No. 110 (2004) of the Bern Convention should be seen as a particular implementation of the Wild Birds

Directive, because it is essential for several protected and endangered species of large birds.

The author points out that intentional killing of birds and knowingly accepting that birds get killed on ill-designed power poles are both treated as the same offence against the Wild Birds Directive (see ruling of the European Court, ref. C-103/00 dated 30.01.2002).

The author further raises doubts, whether the regional authorities will have the necessary specialised knowledge, in order to control and ensure that §53 is carried to completion.

W. Breuer's paper gives also account of the re-introduced Eagle Owl *(Bubo bubo)* population in the Eifel area (9500 km²). The population had gone extinct in the 1970s. With power pylons successively made bird safe after 1990, the re-introduced population rose steeply to 106 breeding pairs in 2005, respectively 115 breeding pairs in 2007. The percentage of losses by electrocution decreased from 23% - 37% in the mid-1980s to mere 1% - 7% after 2000.

The railroad was exempted from §53. Consequently, the Eagle Owl losses due to electrocution on the overhead lines in the Mosel and Rhine valley remain high.

Block 2: A Close Look at Bird Safety

In this richly illustrated compendium, the state-of-research on the effectiveness of bird safety achieved on different types of power poles and with different retrofitting/mitigation methods is summarised. Further technical development effort is needed, in order to reach adequately high effectiveness in bird safety on all types of pylons. There should be no tolerance for tinker solutions. Block 2 is the key chapter of this book and was compiled, in order to provide engineers and technical staffs of the utilities with a better understanding, where the technical state-of-the-art must be improved. The compendium is also intended for use by the authorities, and by local ornithologists.

Chapter 2.1: Electrocution via Defecation. Large birds can produce streams of white urine with a continuous length of significantly longer than 1.5 m, in particular in the early morning hours. This phenomenon has been significantly under-estimated in the past and must be taken into account more seriously in the bird safety assessment of the different types and geometries of pylons.

Chapter 2.2: Insulating Hoods for Pin-Type Insulators – a Success Story. In Germany, the VDEW Construction Guidelines (1991) require all pin-type insulators to be made bird safe with insulating hoods. In 1980, D. Haas and G. Fiedler evaluated all known electrocution cases. Pin-type insulators on metal or pre-stressed concrete pylons were responsible for approx. 70% of all electrocuted White Storks *(Ciconia ciconia)*, and for approx. 97% of all electrocution losses (all species). This latter percentage is biased, because search mostly concentrated on

pylons with pin-type insulators. Insulating hoods proved to be an extremely effective and a very long-lasting solution.

Chapter 2.3: Pylons with Suspended Insulators. Pylons with suspended insulators are generally recognised as the safest solution. This only holds, if the insulators are of adequate length (crossarm to conductors > 60 cm). In particular, air gap lightning arresters on the suspended insulators pose a significant risk for bird safety.

Electrocution via the long defecation/urination stream of large birds is a problem, which was underestimated in the past. In some regions of Spain, the conductors are insulated over a certain length on both sides of the attachment points – an effective solution.

Chapter 2.4: Pylons with Strain Insulators (non-redundant). In the VDEW Construction Guidelines (1991), strain poles are classified "less dangerous", if the distance cross arm to closest energised part is > 60 cm. A better compromise was not achievable in 1990/91, due to lacking evidence. New evidence indicates that the guideline must be changed to > 60 cm of real insulating length.

Air gap lightning arresters on strain pole insulators reduce the effective insulator length and increase electrocution risk significantly.

Currently praticed mitigation methods are not satisfactory. Also on this type of pylon, electrocution via the defecation/urination stream was under-estimated. Again, Spain has pioneered the insulation of the conductors close to the pylon.

If the attachment elements for the conductors are large, as seen on some constructions, they will be used by large birds as landing sites. In particular for bird families, with some birds landing on the grounded cross arm and others on these energised elements, any group interaction can be fatal.

Chapter 2.5: Pylons with redundant (double) Strain Insulators. This type of pylons is increasingly contributing to the death toll of large birds. The electrocution risk of this insulator arrangement was not fully recognised in 1990/91. It is the yoke at the energised end of the insulator pair, which is large enough to be frequently used as landing site. In order to be safe for large birds, this construction must be safe from both landing sites, from the cross arm side and from the energised yoke side. Current constructions regularly do not meet this requirement. Wire brushes on the cross arm even increase the electrocution risk, because the wire brushes are on ground potential and can be reached easily from the yoke side.

Chapter 2.6: Switch Towers and Mast Stations. Switch towers, with their armatures on top of the cross-arm, are highly dangerous. No satisfactory mitigation method could be offered in 1990/91. In the meantime, we know that it is possible to place the switches below the cross arm, as seen in Spain and in Greece.

Improved bird safety must yet be found for complex towers, some of which are extremely dangerous.

Chapter 2.7: Too Closely Spaced Conductors. In case of too closely spaced conductors on wooden poles with pin-type insulators, VDEW Construction Guidelines (1991) require the central pin insulator on the crossarm (plus a length of the conductor) to be covered with an insulating hood. Too close spacing is commonly seen, where conductors are routed to transformers, to over-voltage reactors, or to switching armatures. The only quality solution is insulation.

Chapter 2.8: Underground Cables – the preferred solution and the technology of the future. In Germany, earth cables are widely used in some regions, but not so in others. They fully eliminate the problem of electrocution and of collision. Air cables are not yet sufficiently introduced.

Only these two solutions permit to avoid forest and bush fires caused by electrocuted, burning birds. Too little attention has been paid to this cause of wildfires in drier climates, considering the fact that even in Germany a number of such cases became known.

Chapter 2.9: Expert Recommendations for Improved Construction Guidelines. The VDEW Construction Guidelines (1991) are the technical standard, which was made applicable by §53 of German Nature Conservation Law. With some improvements, this technical standard was also incorporated in Resolution 7.4 of the Bonn Convention (2002) and in Recommendation No. 110 (2004) of the Bern Convention. This important standard reflects the state-of-the-art of the late 1980's, and was a big step forward at that time. After 27 years, its update is long overdue. In this chapter, the recommendations of the specialists at the Muhr-Congress are presented. Generally, under-ground cables or air cables are strongly favored. High-quality insulation methods have proven most effective. Bird guards, deterring rods, etc. cannot guarantee adequate bird safety and are not recognised as acceptable solutions.

Block 3: Field Research and Implementation of Bird Safety

This main chapter comprises various topics ranging from field research to progress control, technical data of modern insulating hoods, and working on energised power lines.

Chaper 3.1: Electrocution and Collision of White Storks (Ciconia ciconia) on Powerlines in the Queich Valley (SW-Germany). The Queichtal in Rhineland-Palatinate (SW-Germany) with its watered meadows during spring and summer developed into an important feeding and staging habitat for White Storks. It is also the site, where the first White Storks of Rhineland-Palatinate were re-introduced. In this area, two different behavioural and biometrical studies were performed: White Stork behaviour on medium-tension pylons (electrocution), and a reaction study of White Storks crossing high-voltage powerlines (collision).

The risk of electrocution on medium-tension strain poles was studied by recording landings and take-offs, behaviour as individuals, and group interactions. The author's conclusion: additional insulation is necessary on strain poles.

The risk of collision was investigated by detailed reaction studies of the White Storks crossing high-voltage powerlines. Based on the results, the author recommends to apply markers on all levels. In the meantime, such a marker concept has been implemented and is under evaluation by the author (see chapter 7.2).

Chapter 3.2: Electrocution Responsible for Lower Reproduction Rates of the Eagle Owl (Bubo bubo) in Bavaria? In the 1950's, Eagle Owls were close to extinction in Germany. Since then, their population recovered to approx. 1200 breeding pairs. While in North-Germany the population is still increasing, the reproduction rate of the Eagle Owls in Bavaria has decreased to mere 0.4-0.7 young owls/breeding pair. This is far too low to maintain their population in Bavaria. A clear decline is apparent since the 1990's.

Because Bavaria is very late with implementing bird safety on medium-voltage pylons, electrocution is still the largest mortality factor, accounting for 47.9% (of n = 44) in 2005 and 2006. Loss of old breeding birds means the loss of the most experienced and most productive breeders. The author fears that this is the crucial factor.

Chapter 3.3: Regional Differences in Pole Constructions, Mitigation Measures for Bird Safety, and in Implementing Underground Cables in Germany. The medium-tension power grid in Germany has a total length of 472,000 km (307,000 km under-ground and 165,000 km overhead lines). The total numbers of pylons of "highly dangerous" construction are estimated to 545,000. They have been, respectively must still be retrofitted and made bird safe.

The author has travelled extensively through Germany and describes the situation in each of the states of Germany. There are strong regional differences in implementing bird safety, and strong differences between the different utilities, in particular in their readiness to change over to under-ground cables. The author's findings indicate, that better coordination and control is urgently needed, in order to meet the requirements of §53 German Nature Conservation Law within the time limit of 2012.

Chapter 3.4: Needs and Criteria for Technical Inspection and Approval. It is obvious, that there is a strong need for a positive catalogue of good engineering solutions for bird-safe pylons of different function. The VDEW Construction Guidelines (1991) were a first attempt, at that time. The authors raise the provocative question, whether the combined engineering power of the large utilities will ever be employed to produce a comprehensive catalogue of good engineering solutions.

For new pylon configurations, there is no mandatory bird safety assessment and approval procedure. Apparently, the lesson was not learned from the high cost for mitigating/retrofitting the "killer poles" of the past.

Mitigation/retrofitting of all existing dangerous poles must be perceived as a demanding project with a challenging completion date in 2012. Such a project is only successful, if progress control is taken serious – or quite inefficient, if progress control is completely missing or if progress control sets in too late. Because the required specialised knowledge and experience with bird safety is lacking in most authorities, the NABU Working Group is prepared to offer support.

Chapter 3.5: Technical Data of Modern Insulating Hoods for Pin-Type Insulators. Insulating hoods for pin-type insulators are widely used in Germany and became the most effective and successful mitigation method. Only those insulating hoods can be recommended, which fulfil the requirements of high quality and of long-life under a wide range of environmental conditions. The insulating hoods produced by Tyco-Raychem had undergone a demanding environmental test program and their material promises a lifetime in excess of 30 years. This product should be used as technical reference. Its technical data are summarised. Outside of Germany, the use of insulating hoods is gradually increasing.

Chapter 3.6: Application of Insulating Hoods, while Powerlines remain energised. At the Bildungs- und Servicezentrum GmbH, Dresden, training for personnel working on energised powerlines is offered. Modern insulating hoods (see chapt. 3.5) are compatible with the tools and manipulators needed to attach them, while the powerlines remain energised and need not to be switched off.

Block 4: Research on Special Phenomena

Chapter 4.1: Post-Mortals on Birds Killed by Electrocution and Collision. In 1993, the Environmental Agency of the state of Brandenburg started a monitoring program on bird losses. On 191 recovered corpses of raptors, owls, storks and cranes, veterinary-pathological examinations were performed. The results showed clearly, that the birds were not weakened by previous injuries or diseases, and that electrocution and collision are unselective mortality factors. On 15% of the electrocuted raptors and owls, and on 25% of the electrocuted storks, no electric burn marks on feathers or tissues were found.

Chapter 4.2: Diagnostics of Electrocution Burn Marks. Burn marks on electrocuted birds were first described by Haas (1980) and Fiedler, Wissner (1980), and were later subject of the PhD Thesis of Christine Pemsel. Some important findings are summarised. Under the electron microscope, characteristic alterations of the feather structure become visible, which only occur on feathers of electrocuted birds. The existence of small typical burn marks of the shape of a stripe, is already reliable evidence of electrocution. The size and the degree of

structure alterations vary considerably with exposure time. These findings are useful for forensic and diagnostic purposes.

12% of the electrocuted birds (n = 231) had no electric burn marks on feathers or tissues.

Block 5: Exemptions for the German Railways

In 2002, the railways in Germany were completely exempted from §53 German Nature Conservation Law. Not even new electrifications or new electrified railway lines must observe any bird safety standards. It can not be understood, why the German Railways manoeuvred themselves into this absurd position, because bird safety on new electrifications or on new electric railway lines is a negligible cost factor, while later retrofitting spells significant cost.

In a few years, the German Railways will be the biggest single owner of "killer poles" and will come into serious conflict with the EU Wild Birds Directive and with Recommendation No. 110 (2004) of the Bern Convention.

Chapter 5.1: The Supply Lines and the Catenary Suspension Systems of the Railways in Europe. In this richly illustrated compendium, different constructions of the overhead electric system (supply lines and catenary system), some dangerous and others safe for birds, are shown and discussed.

Chapter 5.2: Measures to Reduce the Mortality of Birds (Statement of the German Railways). 19,000 km of overall 35,000 km of the German railway lines are electrified. The heaviest traffic occurs on these lines. Interruptions of the traffic due to short-circuit damages caused by birds must be avoided for ecological and for economic reasons. The internal construction guidelines DS 997.9114 were introduced in April 2003 and are applied in areas of avifaunistic importance on lines under construction, as well as on existing lines.

Chapter 5.3: The Wrong Philosophy of the German Railways. Because short-circuit events can lead to technical damages, each short-circuit is investigated by the railways. The statistics give a first idea of the annual number of electrocuted birds: 2,700 birds killed by short-circuit; plus 4,000 unresolved short-circuit events. Electrocutions of birds, where only a few milli-amperes flow, are not observable at the control centers and have not entered the statistics.

The paper shows, how effectively small modifications of some elements of the catenary system and of the supply lines can improve bird safety. Although, the German Railways have developed and introduced construction guidelines for bird safety, these are not consistently applied, but only in "areas of avifaunistic importance", or in "areas with large birds". In the past, it was not possible to communicate to the representatives of the railways, that large birds are present everywhere in Germany and that protected species of large birds are not restricted to "areas of avifaunistic importance".

Block 6: Bird Safety International

NABU working group „Birds and Powerlines" was always aware that electrocution on „killer poles" is a world-wide problem. Early involvement in Spain (1976/77), research in Eastern Central Europe, the Bonn Convention and the Bern Convention are examples. With five contributions and two reviews of published papers, the importance of international co-operation and involvement is emphasised.

Chapter 6.1: Bird Losses due to Electrocution in Spain – Results of Random Searches in 1999-2005. Although the Iberian Peninsula is a huge subcontinent, much has already been achieved thanks to the excellent work of Spanish conservationists (research, publications, campaigns) and due to progress in regional legislation. Quite a number of new mitigation methods are under evaluation. The paper reports the results of surveys undertaken in 1999-2005 on six ornithological trips to Spain. Approx. 110 pylons were visited three times, each. In total 241 electrocuted birds were recorded. The collected data were made available to the Spanish Ornithological Society (SEO) and to the authorities. In the province of Extremadura, retrofitting was performed with support from the EU Intereg III program. In Aragon, retrofitting has started.

Chapter 6.2: Increasing Electrocution Hazard in East Central Europe and in South-East Europe from Reconstructed and New Powerlines. 10 years after the Warsaw Pakt broke up, EURONATUR sponsored a survey of powerlines in Poland, Hungary and Croatia, as well as further trips to the Balkan states. Only in Slovenia, effective steps against electrocution are taken. In all of the other visited countries, the situation is discouraging.

A huge opportunity was missed, and still is being missed, while many powerlines were reconstructed or newly built, many of them with support from international aid. Instead of bird safe pylons, "killer poles" are widely in use, sparing neither national parks, nor Important Bird Areas (IBA), nor regions which could well qualify for IBA. This situation is so much out of control, that political action by the EU is urgently needed.

The paper also mentions two large wildfires (near Dubrovnik and in Livanjsko Polje). There is strong indication, that they were ignited by burning electrocuted birds.

Chapter 6.3: Medium-Voltage Power Lines and Bird Mortality in Hungary In 2004, MME/BirdLife Hungary documented the severity of the electrocution problem and the efforts of conservationists in Hungary. For this book, this valuable paper is reviewed, summarised and discussed. The situation in Hungary was so desparate that in 1990 conservationists by themselves started to develop and produce insulating covers. These crossarm covers are quite effective for "triangular" pole tops. By 2004, altogether crossarm covers for approximately 34,000 poles were produced and financed mostly from private side.

In the meantime, the Hungarian utilities are owned by large French and German utilities (EdF, RWE, E.ON). The situation did not change much, except that some new pole designs were introduced, which are even more dangerous than the "triangular" poles: crossarm with 3 very closely spaced pin-type insulator. On these ill-designed poles, crossarm covers are useless for bird safety.

The NGOs performed a nation-wide survey to estimate the total losses by electrocution. These bird losses were cautiously extrapolated and expressed in money: 6 million €, annually. They may well be twice as high.

Chapter 6.4: Endangered Avifauna – Medium-Tension Powerlines in Central Kazachstan. Ernst-Moritz Arndt University in Greifswald, with support from the DAAD GoEast Program, has started a program to eventually introduce and industrialise insulation hoods in Kazakstan, as the most promising mitigation method for the huge numbers of "killer poles" – a legacy of the former Soviet Union. The first step, a survey and monitoring program was carried out by Ulrike Lasch, in the area of the Tengiz-Lake system, a Ramsar wetland in Central Kazakstan. Recorded electrocution losses of 1.5 to 8.6 birds/km/month are extremely high and illustrate the urgency of improving bird safety in Kazakstan.

Chapter 6.5: Electrocution alters the distribution and density of a top predator, the Eagle Owl *(Bubo bubo)* by F. Sergio, L. Marchesi, P. Pedrini, M. Ferrer, V. Penteriani, published in Journal of Applied Ecology 41 (2004) 836-845:

This paper is reviewed, summarised and discussed as an interesting complement to chapter 1.4 and chapter 3.2. The paper analyses the effect of electrocution on two Eagle Owl populations in Italy: a recently crashed population in the Abruzzo region, where the steep decline to a high-risk high-altitude population took place between 1980 and 1990, and a stable low-altitude population in the Trento region (Italian Alps). The Trento population is (still) capable to replace electrocution losses, because of a very high reproduction rate due to optimum habitats.

The effect of powerlines and the occurrence of electrocution losses is carefully analysed for both Eagle Owl populations. Recommendation are made, how to improve bird safety on powerlines for the Eagle Owls in both regions. These recommendations and the experience gained by the successful Eifel program (see chapter 1.4) differ and should be reconciled.

Chapter 6.6: USA – Waiting for the Break-Through. The USA have good reason to take pride in their impressive birds of prey. Shocking numbers of electrocuted raptors were first reported in 1970. Following this, excellent research and reference work was done. But then the USA lost the lead, and the ultimate breakthrough in bird safety on powerlines has not yet been achieved. The reasons are diverse. But certainly such a large task cannot be mastered without clear federal laws and without implementing the precautionary principle in nature conservation legislation.

Chapter 6.7: Medium- and High-Tension Powerlines, and Pylon Constructions in Iceland. Field report from Iceland. One-level high-voltage power lines without neutral lines, and very safe, wooden medium-voltage pylons are commonly seen. But also wooden pylons with pin-type insulators on the crossarm, and too closely spaced conductors are used. They represent considerable risk of phase-to-phase electrocution e.g. for the White-Tailed Eagles (Haliaeetus albicilla). The Icelandic authorities would be well-advised to review pole designs in detail, in order to ensure a consistently high standard in bird safety. Additionally, possibilities to avoid or to reduce local collision hot spots should be sought.

Block 7: Bird Losses due to Collision

Collision of birds with powerlines was subject of utility sponsored research in Germany and was published in Vogel und Umwelt, Band 9, Sonderheft, December 1997. For this reason, only two new papers are included:

Chapter 7.1: Risk of Collision on Powerlines in River Systems. In Slovenia, major bird migration corridors meet. The river systems are important "flight lanes", and for water fowl also important feeding areas. Both leads to significant "air traffic" along the rivers, at day and at night. Very little is known about high-voltage powerlines crossing river systems and about the effects of topographic factors, such as width of the river bed and height of the woods along the river banks.

As part of an environmental impact assessment for a 400 kV powerline, reaction studies were performed on three existing mast fields crossing the Drau River and the Mur River. Results and conclusions are presented.

Chapter 7.2: Optical Markers on a 110 kV Powerline in the Queich Valley/ Rhineland-Palatinate (SW-Germany). Based on previous research (see chapt. 3.1), the utility Pfalzwerke AG (Ludwigshafen) funded a marker system over 1.35 km length in the Queich Valley. The marker system was specifically conceived to reduce collision risk for the White Storks in this area. In February 2007, flap bundles were attached on all conductors at each level of the mast line. Black-and-white flap bundles (supplier: RIBE) were selected, because they are easier to attach, larger in size, and better visible. They are attached every 10 m, and off-set by 5 m between the conductors of each level, in order to increase the impression of an obstacle. Approximate cost: 40,000 €.

Outlook and Way Forward. The book concludes with a brief outlook and way forward in English.

Einleitung

Den Kongress „Stromtod von Vögeln" in Muhr am See veranstaltete die Bundesarbeitsgemeinschaft Stromtod im Naturschutzbund Deutschland e. V. (NABU BAG Stromtod) zusammen mit dem Landesbund für Vogelschutz in Bayern e. V. (LBV) vom 31. März bis 2. April 2006. Notwendig wurde dieser Kongress wegen erkennbarer Fehlentwicklungen bei der Umsetzung der gesetzlichen Vorgaben zum Vogelschutz an Mittelspannungsfreileitungen.

Während der Vor- und Nachbereitung des Kongresses wurde soviel Handlungsbedarf erkennbar und soviel Material verfügbar, dass sich die BAG Stromtod zur Herausgabe dieser erweiterten Kongress-Dokumentation entschloss.

Nach wie vor bietet unsere Publikation von 1980 verlässliche Grundlagen, auf die wir uns immer noch stützen – ebenso wie auf den VDEW-Maßnahmenkatalog von 1991.[1] Ihre vorausschauende Respektierung hätte bestimmt manche Fehlentwicklung verhindern können. Überarbeitung und Ergänzung dieser Werke sind inzwischen überfällig. Von ornithologischer und naturschutzrechtlicher Seite soll das der vorliegende Band leisten.

Die massenhafte Tötung von Vögeln durch Stromschlag und die bestandsbedrohenden Verluste einiger Vogelarten sind seit Beginn des Energietransports durch Freileitungen bekannt. Sie wurden seit über 130 Jahren in zahlreichen Publikationen beschrieben: als weltweites Problem für freilebende Vögel ebenso wie als Problem für die technische Sicherheit der Freileitungen. Längst gibt es für alle Arten des Stromtransports vogelsichere Alternativen, welche die Gefahr von Stromschlägen praktisch ausschalten. Das Problem könnte also schon lange gelöst sein!

Leider gab es in der Vergangenheit neben Erfolgen immer wieder große technische Rückschritte. Zwischen 1950 bis in die 1970er Jahre wurden im großen Stil die alten, relativ sicheren Mittelspannungsmasten aus Holz durch neue Konstruktionen ersetzt. Die Masten und ihre Quertraversen wurden nun aus relativ leitfähigem Spannbeton oder aus bestens leitfähigem Metall konstruiert. Die Stromleiter wurden oft auf kurzen Stützisolatoren über die Traversen geführt. Auf diesen „elektrischen Stühlen" endeten zahllose Großvögel durch Stromschlag. Die Populationen eindrucksvoller Großvögel – Uhus, Adler, Milane, Störche – erlitten zum Teil bestandsbedrohende Verluste in ganzen Regionen. Glücklicherweise

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1 Beiträge von Haas, D.; Fiedler, G. & Wissner, A.; Heijnis, R. in: Deutscher Bund für Vogelschutz: Verdrahtung der Landschaft: Auswirkungen auf die Vogelwelt. Ökologie der Vögel, Bd. 2 (Sonderheft), 1980.

VDEW, Vereinigung Deutscher Elektrizitätswerke e. V. (Hrsg.) (1991): Vogelschutz an Starkstrom-Freileitungen mit Nennspannungen über 1 kV. Erläuterungen zu Abschnitt 8.10 „Vogelschutz" der Bestimmung DIN VDE 0210/12.85. 2. Auflage

machten nicht alle deutschen Firmen diesen verheerenden Trend mit. Ein großer Teil verzichtete generell auf die Aufstellung solcher „Killermasten" und benutzte für Vögel weniger gefährliche Masten mit langen Hängeisolatoren. Die unterschiedliche Vorgehensweise begründeten Vertreter aus Energieversorgungsunternehmen mit einer „unterschiedlichen Firmenphilosophie".

Inzwischen hat die Gesetzgebung sich dieser Missstände angenommen. In Deutschland ist das Aufstellen von neuen „Killermasten" verboten, und die bestehenden Masten der gefährlichsten Typen müssen – nach § 53 Bundesnaturschutzgesetz von 2002 – bis 2012 flächendeckend nach dem Stand der Technik entschärft sein.

Einige Energieversorgungsunternehmen haben sich vorbildlich verhalten und schon jetzt ihr gesamtes Mittelspannungsnetz vollständig entschärft oder sukzessive durch Erdkabel ersetzt. Andere dagegen unterlaufen den Stand der Technik mit alten und nicht bewährten Entschärfungsmethoden, deren Unwirksamkeit längst erwiesen ist. Diese Fehlentwicklung muss korrigiert werden.

Auch die Deutsche Bahn (DB), im § 53 mit ihren oft gefährlichen Fahrleitungsmasten noch ausgenommen, ist heute aufgrund der internationalen Übereinkommen – der Bonner Konvention (CMS) von 2002 und der Berner Konvention von 2004 – angehalten, ab sofort nur noch vogelsichere Konstruktionen zu verwenden und die alten gefährlichen Fahrleitungsmasten sukzessive zu entschärfen. Das kommt auch der Sicherheit und Zuverlässigkeit des Zugverkehrs zugute. Die bisherige internationale Willkürlichkeit der Konstruktion von Fahrleitungsmasten ohne Rücksicht auf Vogelsicherheit kommt im 5. Block zur Sprache, überfälliger technischer Fortschritt wird angemahnt.

Zwar hat die Deutsche Bahn 2003 einen Maßnahmenkatalog zum Vogelschutz an ihren elektrischen Fahrleitungen erstellt, allerdings sieht er die Anwendung nur „in Gebieten mit ornithologischer Bedeutung" vor. Eine nicht weiter vetretbare Einschränkung: Schon wegen der erfreulichen Wiederausbreitung einiger bedrohter Großvogelarten in Deutschland, wie Uhu, Weiß- und Schwarzstorch, Rotmilan, Wanderfalke oder Seeadler, muss der DB-Maßnahmenkatalog zum Vogelschutz flächendeckend angewendet werden, so die einhellige Meinung der vogelkundigen Experten auf dem Kongress.

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Der Anlass für diesen Kongress waren erkennbare Mängel bei der Umsetzung des Vogelschutz-Paragraphen (§ 53): in Bezug auf den Stand der Technik und bezüglich des gesetzlich vorgegebenen Zeitrahmens für die Entschärfung der bestehenden Altlasten.

Hier veröffentlichen wir nun neue Arbeiten aus dem In- und Ausland – darunter auch solche, die während des Kongresses aus Zeitgründen nicht vorgetragen

werden konnten oder erst später verfasst wurden. Wir beschreiben umfassend die Phänomenologie des Stromschlags und begründen die Notwendigkeit, den technischen Standard zur Entschärfung der Masten neu zu definieren. Auch die Rechtslage – national und international – wird ausführlich beschrieben. Wir empfehlen unsere Arbeit als Referenzwerk für alle, die sich beruflich oder als ehrenamtliche Naturschützer mit dem Vogelschutz an Freileitungen befassen.[2]

Die Vorbereitung dieses Initiativ-Kongresses hat tausende ehrenamtlich geleistete Stunden und Geld gekostet. Ebenso viel Aufwand erforderte die Nachbereitung des Kongresses. Unser herzlicher Dank gilt allen ehrenamtlichen Mitarbeitern ebenso wie den Experten aus den Ministerien, den Firmen und der Deutschen Bahn. Ebenso herzlich danken wir allen beitragenden Text- und Bildautoren. Unverzichtbar waren auch die zahlreichen Fallmeldungen und Fallbeschreibungen, die uns übermittelt wurden.

Ganz besonders danken wir Dagmar Furtmeier und Alf Pille vom Landesbund für Vogelschutz in Bayern e. V. sowie Waltraut Haas; sie haben mit ihrem tatkräftigen Einsatz den Kongress in Muhr am See ermöglicht. Last but not least danken wir von Herzen unseren Ehefrauen – Uschi Haas und Bernhild Schürenberg – für ihre Jahrzehnte währende Unterstützung!

Dieter Haas, Bernd Schürenberg

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2 Zum umfassenden Studium aller Aspekte und Probleme zum Thema empfehlen wir auch die Abhandlung „Vogelschutz an Freileitungen" (Protecting Birds on Powerlines), 2003 von der NABU BAG Stromtod erstellt im Auftrag von BirdLife International für die Berner Konvention. Die Originaltexte sowie die Abbildungen sind abrufbar unter www.birdsandpowerlines.org.

Diese Arbeit wurde nach einem Jahr der Prüfung von den Mitgliedstaaten der Berner Konvention inhaltlich voll akzeptiert. Sie bildet die fachliche Grundlage für die vom Ständigen Ausschuss des Europarates im Dezember 2004 verabschiedeten Empfehlungen, auf die sich die Gesetzgebung der Mitgliedsländer stützen soll. Die vom Europarat veröffentlichte Fachpublikation kann bestellt werden beim Council of Europe Publishing, F-67075 Strasbourg Cedex: Protecting birds from powerlines; Nature and environment, No. 140, 3.2005, ISBN 92-871-5630-1.