POWER SYSTEM ENVIRONMENTAL PERFORMANCE
C3 - 00

SPECIAL REPORT FOR SC C3
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Information about the procedure for virtual session

The Centennial Session 2021 will be a virtual session. This makes some alterations necessary for the Group discussion Meeting (GDM), compared to "traditional" physical sessions.
The SC C3 GDM is scheduled for Friday, August 27th.

- The session style of the GDM at the Centennial virtual session 2021 is on-live, emulating the regular GDM as much as possible. Contributors are asked to make a live presentation from remote.
- C3 Contributors are asked to upload their proposed contributions derived from the Special Report on the Registrations platform before 25th of July. The contributions will be like the traditional mode: a word document and PowerPoint (without voice-over), aiming to be presented in 3 minutes.
- The SC Chair and the Special Reporters will review the proposed contributions and give possible contributors the acceptance to present their presentations at the GDM - as usual. Contributors will be contacted by Special Reporters if any recommendation or change is required.
- After acceptance of the contribution, Central Office will contact all accepted contributors and ask to access the "LENI system" to record their final versions as voice-over files as a backup, just in case the remote lively participation shows any issue.
  The files for our SC 3 GDM shall be uploaded till 23rd August. The LENI platform will be available only to contributors whose contribution has been validated by the Study Committees. Central office will provide guidelines and suitable information related to this LENI system on the web.

1. PS1 – United Nations Sustainable Development Goals

1.1 General

The Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere. The 17 Goals were adopted by all UN Member States in 2015, as part of the 2030 Agenda for Sustainable Development which set out a 15-year plan to achieve the Goals.

With only ten years left to achieve the Sustainable Development Goals, world leaders at the SDG Summit in September 2019 called for a decade of action and delivery for sustainable development, and pledged to mobilize financing, enhance national implementation and strengthen institutions to achieve the Goals by the target date of 2030, leaving no one behind.

The electric power sector certainly plays a crucial role for the achievement of the Sustainable Development Goals as some of the targets directly relate to the core activities of the electric power sector. These are:

- SDG 7, Affordable and Clean energy: achieve energy access for all and meet targets for renewable energy and energy efficiency. Meaningful improvements will require higher levels of financing and bolder policy commitments, together with the willingness of countries to embrace new technologies on a much wider scale. The electric power industry bears the responsibility, within the given political framework, to increase the share of renewable energy and energy efficiency.

- SDG 13, Climate Action: Take urgent action to combat climate change and its impacts. Mitigating climate change and its impacts will require building on the momentum achieved by the Paris Agreement on Climate Change. The global nature of climate change calls for broad international cooperation in building resilience and adaptive capacity to its adverse effects, developing sustainable low-carbon pathways to the future, and accelerating the reduction of global greenhouse gas emissions. The electric power industry and climate mutually influence each other. The industry faces outages due to hazards or natural disasters, a more volatile balance, a variable supply and demand, for instance by electric vehicles which help protect the climate through their efficiency. On the other hand, our industry is contributing more and more to climate change protection. The Paris agreement and the worldwide targets of reducing CO2 emissions have enormous influence on our industry: integrating renewables into the grid, looking for off-grid solutions, the emphasis on storage, it all provides improvement for climate protection.

Further, as reliable power supply and transmission is a major element of the infrastructural development in general and as electrical energy is crucial for social wellbeing and economic development the electric power sector contributes to the achievement of several other SDGs.

Preferential Subject 1 aims to highlight outstanding examples of how the targets can be implemented in the electric power sector.

1.2 Papers description and discussion

Totally 8 papers were accepted for Preferential Subject 1 providing a broad overview on how the UN Sustainable Development Goals are currently addressed in the electric power sector.

One group of publications describes how the SDG may serve as a “sustainability compass” for companies in the electric power sector. The SDGs cover the most relevant global sustainability issues that are to be addressed by all nations over the next 10 years. Thus, they represent a broad range of sustainability issues against which companies can measure themselves in all their activities.

In this respect, the SDG topics can be used to incorporate relevant aspects into the stakeholder dialogue for the realization of infrastructure projects. **Paper C3-101**, *Sustainable Development Goals and their importance in the relationship between First Nations and Energy Producer Companies*, seeks to show the importance of the Sustainable Development Goals for involving indigenous people in a stakeholder process to construct a small-scale hydro power station in Brazil. The energy company developing the project hopes that starting the process in partnership with traditional communities with a legal structure developed in conjunction with the various agencies, based strongly in the Sustainable Development Goals will increase the chances of success of its implementation bringing cultural, social and economic benefits to the local community, as well as to the community of general form. Thus, SDGs provide points of reference on thematic topics that may be addressed in a stakeholder process.

Papers C3-103 and C3-105 deal with the challenges coming along with the realization of new power grid projects. In **paper C3-103**, *Methodology for the evaluation of a "better grid project" implementation*, a methodological framework is presented which aims to accelerate the realization of grid projects by engaging stakeholder groups in an early stage of development. The methodology is based on an adaptation of the ENTSO-E cost-benefit analysis (CBA) and entails a comparison between the "standard" project realisation and the "better" project implementation. The applicability of the methodology is presented on a case study in Germany. Avoiding delays of grid projects is fundamental for meeting the targets of a fully decarbonised, largely renewable and a sustainable electricity system by 2050 and thus, supporting the achievement of the SDGs No. 7, Affordable and Clean Energy and No. 9 Industry, Innovation and Infrastructure. **Paper C3-105**, *Terna Envision path for Sustainable Electrical Infrastructure*, describes the experience of Terna to implement the "Envision" protocol, which is a holistic framework for evaluating and rating the community, environmental, and economic benefits of all types and sizes of infrastructure projects. Thus, it allows to assess the extensive external benefits and impacts that power grid infrastructure projects may have on a community. The framework comprises a set of 64 KPIs grouped into 5 categories describing sustainability aspects specifically for infrastructure projects. The 5 categories are mapped according to their contribution to the respective SDGs.

A more general discussion on how SDG topics could be addressed in any infrastructure project in the electric power sector is provided in **paper C3-107**, *Research and Empirical Analysis of Sustainability Management System of PowerGrid Enterprises*. In this paper, a KPI set for power grid companies is presented based on the example of State Grid Corporation of China to include a very broad variety of sustainability aspects in business strategies. A selection of the KPI set was applied in a case study dealing with the promotion of infrastructure for electric vehicles in China. The KPIs are aligned with corresponding SDGs.

SDG topics may also serve as orientation for the optimization of existing power generating assets. For example, to improve local air quality in northern China, electricity production from coal-fired power plants needs to be reduced. In **paper C3-106**, *Fighting Against Haze via Generation Scheduling with Coal Reduction Constraints: Practice in Shaanxi China*, a novel day-ahead generation scheduling model is proposed considering coal reduction constraints as well as a local air pollutant dispersion model. Including such a dispersion model, the total emission reduction needed to obtain certain local air quality levels varies daily depending for example on local weather and wind conditions and is thus more accurate. The application of the proposed method is shown on a case study from Shaanxi Province in Northwest China. With this model, local air quality can be improved which supports the achievement of the SDGs.

Finally, SDG topic may also be used to benchmark the optimization of the whole power system. **Paper C3-108**, *Research on the Method to Tap the Potential of Electricity Substitution Based on the Digital Characteristics of Load Curve*, proposes a method to substitute dispersed combustion of coal, biomass and other fossil energy with electrical energy. This will result in meeting the regional energy consumption demand as well as emission reduction targets. The method is based on sophisticated electrical load curve predictions and substitution potential. The method has been presented in a case study carried out for the Chinese province "Fujian".

The second group of publications deals with the question, how companies in the electric power sector may use the SDGs as business opportunity. One possibility is to align R&D strategies according to the SDGs. **Paper C3-102**, *Building the R&D business case for Sustainable Development in the Electricity Sector in Brazil*, presents an investigation on how R&D activities result in products and solutions contributing to the achievement of the SDG in Brazil. As a conclusion, the authors suggest considering additional criteria during the evaluation and selection process of R&D projects in the electric power sector in order to get more focus towards sustainable innovation and thus, to contribute to the achievement of the SDG.

Further, a company may also align its portfolio of existing and new business activities towards the SDGs. **Paper C3-104**, *Opportunities and Challenges Related to SDGs in the Electric Power Sector: Analysis of Companies in Japan and Worldwide*, presents the results of a literature review and online questionnaire about the implementation of SDG in the electric power sector. It is shown that the electric power sector may contribute to the achievement of multiple SDGs. In particular business activities related to the expansion of renewable energy, battery storage systems and customer energy efficiency result in a great contribution to the achievement of the decarbonisation goals (SDG 13) and increasing access to electricity (SDG 7). However, in most of the investigated companies, business strategies are not yet aligned to SDGs as they are considered more as a CSR trend rather than business opportunity. The challenges identified clearly indicate the need for a regulatory framework and policies to encourage electric power companies to develop business strategies that also aim to contribute to achieving other SDGs.

1.3 Questions to Preferential Subject 1

The 3 main questions Q1, Q2, Q3 were raised in the description of PS1 and asked to be addressed by the papers prepared.

Q1: How do companies in the electric power sector integrate the SDG's in their business strategy to contribute to their achievement?

- Q1.1: Papers C3-101, C3-103, C3-106, C3-107, C3-108 use the SDGs as an orientation framework to identify the relevant sustainability issue that could potentially be affected by the company's activities. It is unclear, however, what the potential of the proposed methods / approaches is to contribute to the achievement of the SDGs. Could you provide an estimation?
- Q1.2: all Papers: The 17 SDGs are underpinned by 169 concrete targets to measure the progress made in achieving the objectives. None of the papers refer to the target level. What targets are particularly relevant for the Electric Power Sector?

Q2: What are the main challenges to do so?

- Q2.1, Papers C3-101, C3-102, C3-103, C3-106, C3-107, C3-108: Paper C3-104 suggests, that the "challenges in encouraging electric power companies to include SDGs in their business cases include leadership by the top management, ensuring there is capacity to develop a business case and the existence of appropriate policies to encourage such development." What challenges do the other paper authors see?

Q3: In what way do companies benefit of integrating SDG's in their business strategies?

- Q3.1, Papers C3-101, C3-102, C3-103, C3-106, C3-107, C3-108: Paper C3-104 states that "particularly those companies dealing with renewable energy, batteries and customer energy efficiency benefit from integrating SDGs in their business strategies." What benefits do the other paper authors see?
- Q3.2, all Papers: What changes or developments are needed in the future to ensure that companies in the electric power sector will benefit more from aligning their business strategies towards the achievement of the SDGs?

2. PS2: Environmental impact of Energy Transition

2.1 General

The energy transition aims to transform the present energy system that is based on fossil fuels into one based on renewable energy sources. Preferential Subject 2 (PS2) addresses environmental impact of this energy transition and aims to discuss the science and practice related to three major questions: (1) What are the effects of raw materials becoming scarce? (2) Which methods are used for measuring these impacts, regarding the whole chain? (3) How to deal with the negative impacts of energy transition?

2.2 Papers description and discussion

Ten papers have been received for this PS. They have been classified to these three thematic questions: issues related to effects of materials becoming scarce (C3-201), measuring impacts (C3-202, C3-210, C3-206, C3-208) and mitigating measures (C3-207, C3-204, C3-205, C3-209 and the paper from the Next Generation Network).

C3-201, *An analysis of the Dye Sensitized Solar Cell (USA).* The current solar photovoltaic (PV) is already the leading renewable source, but a next generation solar PV technology – the Dye Sensitized Solar Cell (DSSC) is even more appealing especially when considering the environment, the supply chain, and how it deals with negative impacts of energy transition. Large-scale use of PV devices for electricity generation is expensive at present: a comparison between the DSSC raw materials and the current solar PV is made in this paper. The cost analysis presented looks at the installed capital costs, material costs, and levelized energy cost that shows the DSSC competitive with current as well as other future solar cell technologies. A situational analysis (SWOT) of this exciting technology in both the solar and wider generating environments is also included.

C3-202, *Limiting land degradation and carbon footprint when developing new transmission lines (Norway)*. The project "Increase environmental responsibility and reduce greenhouse gas emissions during construction work (GRAN)" aims to find solutions that limit the loss of nature when planning and building new transmission lines and substations. The focus of this paper is a field vegetation survey which maps revegetation from construction sites in large parts of Norway. Vegetation cover is analysed by revegetation treatment, and it shows that different treatment affects both total vegetation cover and the composition of functional groups. Together with ongoing work to further enhance knowledge on land use, revegetation and carbon emissions, this data will give u valuable knowledge on how to reduce the footprint on nature while developing the power grid.

C3-210, *Environmental impact of energy transition Lessons learned from a first experience on the French adequacy forecast study (France).* In the energy transition context, RTE is committed to improve this process with an analysis of the environmental impacts of the French power system evolution. To date, only the Green House Gases emissions of the generation mix in operation are assessed. The method described in this paper extends the analysis to other environmental impacts (not only climate change) throughout the life cycle of power plants. Here RTE used the Attributional Life Cycle Assessment method. The developed method based on LCA evaluates the direct impacts associated with electricity generation and the indirect impacts associated with construction and dismantling of power plant infrastructure.

C3-207, *How eco-design helps to inform the digital transformation strategy of RTE? (France).* Innovations enabled by information technologies and communication offer solutions, smart grids, to meet these challenges. Their deployment is a potential lever for the economic optimization of the entire electrical system, reducing its environmental footprint while maintaining a competitive industrial sector. The digital transformation gives TSOs and DSOs the opportunity to contribute to the optimization of the electricity mix and its operation, while reducing its impact on the environment. However, the digital backbone of electricity networks and tertiary applications have a significant weight in a TSO's/DSO's environmental footprint.

C3-204, *Integrating Natural Capital Assessment in the creation of substations: Sustainable substation; from dream to reality Case description Substation de Laarberg (Netherlands).* DSO Liander has requested the market to design and build a 'sustainable' substation. With attention to circular construction, reducing CO2 emissions and promoting biodiversity. This paper describes the request, the process and the result. The result shows that this sustainable substation has a much more favourable impact on the natural environment than a traditional building: a saving of around 50%.

C3-206, *The impact of distributed generation intensive development on ecological performance of remote power supply centers (Russia).* This paper presents the results of the assessment of distributed generation systems impact on the economic and environmental performance of remote microgrids and bulk power systems in general. The focus is made on cumulative technological and economic performance of remote microgrid energy infrastructure as well as cumulative environmental damage arising from manufacturing, implementation and operation of power supply systems within the lifecycle of the power and energy production assets.

C3-205, *Environment, Health and safety Aspects of Gas-Insulated Electric Power Equipment Containing Non-SF6 Gases and Gas Mixtures (China).* This paper highlights the impact of different non-SF6 gases and gas mixtures on different environment, health and safety aspects to be considered when developing, installing, operating and disposing gas-insulated systems containing such gases. The results shown in this paper are expected to be valuable for the ongoing discussions in several technical bodies, particularly in Cigré working groups B3.45, D1.67 and A3.41, about environment, health and safety aspects of gas-insulated systems containing non-SF6 gases and gas mixtures.

C3-208, *The environmental impact of the regasification process: case study for the first Floating Storage Regasification Unit (FSRU) project in Thailand (Thailand).* Thailand started to import natural gas from foreign countries after a coal fired power plant project in southern of Thailand was cancelled due objections by stakeholders and NGOs regarding the impact on pollution, health and environmental impact. The transition to coal to Liquefied Natural Gas (LNG) included new infrastructure for loading LNG, regasification from LNG to natural gas and sending natural gas to the South of Bangkok power plant. This paper is about the environmental impact of this infrastructure called Floating Storage Regasification Unit (FSRU) is the first FSRU in Thailand. The main impact of this transition is discharged water with free residual chlorine from the regasification process.

C3-209, *Experience on Electric and Magnetic field induction under 765/400kV power transmission lines (India).* Transmission lines are designed to keep Electric and Magnetic field at ground level under limits governed by ICNIRP/IEEE guidelines. This paper in general discusses experience on electric field and magnetic field induction issues faced by transmission line personnel. The paper also discusses proposed and implemented solutions.

C3-NGN, *Next Generation Network – Aurore Bailly: mixing landscape architecture and engineering – Evolution of professional practices in the transformation of electric system infrastructures (France).* In a context of tension between the desire to accelerate the Energy Transition and an increasing number of lawsuits for spatial qualities on renewable energy infrastructure projects (ENR), such as the emblematic wind turbines, the landscape become a major issue in the implementation of the Energy Transition. The French transmission system operator (RTE) and the French National School of Landscape Architecture have been experimenting since 2015 in order to improve the place of infrastructure in the landscape and the territories, with a sustainable development approach. The results of these experiments, obtained thanks to the collaboration of RTE engineers and territorial stakeholders, are spatial prospective view of the sites linking an efficient electrical system with a territorial vision, combining environmental stakes and the development of public spaces.

2.3 Questions to Preferential Subject 2

The 3 main questions Q1, Q2, Q3 were raised in the description of PS2 and asked to be addressed by the papers prepared.

Q1: What are the effects of raw materials becoming scarce?

- Q1.1: Paper C3-201, What are the emissions associated with other stages of the DSSC solar lifecycle, manufacturing, materials transportation, installation, maintenance, and decommissioning and dismantlement?

Q2: Which methods are used for measuring these impacts?

- Q2.1: Papers C3-202, C3-210, In this PS various environmental impact assessments of different facilities are reviewed. What are the lessons learned from the other papers?
- Q2.2: Paper C3-206, The environmental impacts associated with manufacturing and maintenance can vary depending on the technology. What's the advantage of off grid solutions?
- Q2.3: Paper C3-208, How to improve the environmental impact of the infrastructure called Floating Storage Regasification Unit (FSRU). What are the lessons learned with attention to circular construction, reducing CO2 emissions and promoting biodiversity?

Q3: How to deal with the negative impacts of energy transition?

- Q3.1: Papers C3-207, C3-204 and C-NGN, depending on their location, larger renewable energy facilities can raise concerns about land degradation and habitat loss. Total land area requirements vary depending on the technology and the topography of the site. How can land impacts be minimized?
- Q3.1: Papers C3-205 and C3-209, The environmental, health and safety aspects of gas-insulated systems and the electric and magnetic field of power transmission lines are well known CIGRE topics. What new topics do the other authors see to be discussed with other working groups?

3. PS3: Relation of wildlife and electrical infrastructure

3.1 General

The links between wildlife and electrical infrastructures have two types of implications. From the biodiversity side, infrastructure causes impacts, mostly negative, on animal and plant species populations. This makes many companies adopt policies to mitigate impacts, following Sustainable Development Goals (SDG) and Environmental Responsibility guidelines. From the companies' perspective, wildlife is often the source of impacts affecting the reliability of electric systems. PS 3 addresses these relationships between wildlife and electrical infrastructure, and aims to discuss the science and practice related to three major questions: (i) How to prevent damages or outages for generation, transmission, and distribution equipment from birds, rodents, or other species; (ii) Which methods are used and which data are needed to determine mortality; (iii) Which methods for mitigation are used.

3.2 Papers description and discussion

Eight papers have been received for this PS. They have been classified into three main thematic groups: issues related to planning for biodiversity impact mitigation (C3-301, C3-306, C3-307), monitoring methods to assess mortality impacts (C3-302, C3-305) and procedures for impact mitigation (C3-303, C3-304 and the paper from the Next Generation Network - L. Martins).

a) Planning for biodiversity impact mitigation

This set of 3 papers deals with

Paper C3-301 Avian Action Plan, a comprehensive strategy for bird protection: The paper presents a strategy developed by a TSO to develop an integrated approach for biodiversity protection through the implementation of an Avian Action Plan (AAP) to reduce the risks, both to infrastructures and birds, deriving from the interaction of the bird populations with the network. The different components of a AAP are presented, with illustrative examples, and including: risk assessment methodology for birdlife; design methods aimed at minimizing the impacts on bird populations; staff training on AAP policies and procedures; reporting to monitor the impacts on birds and the effectiveness of mitigation and compensation measures; mitigation measures to reduce the potential collision risk; procedures for the management of artificial and natural nests in view of the safety of the network; communication of issues concerning birds and power lines. The authors also report the implementation of a bird migration monitoring near a power line, using radar plus direct observations that did not register any bird collision in a 3-year period.

Paper C3-306 A nature-protection supervision in the construction of infrastructure objects as an example of good practice: Hydroelectric power plants and associated dams are a driver of significant negative impacts on wildlife. However, they can also be used to develop management plans with positive biodiversity effects. This paper presents one example of wildlife impact mitigation and compensation activities in a water reservoir created by a hydroelectric power plant. A multidisciplinary team was created to coordinate the required activities, including technical staff from the company responsible by the construction of the dam, engineers, ecologists and landscape architects. Different habitat management activities and implementation challenges are described including, among others, habitat creation for threatened turtle and insect species, artificial islands, fluctuating bird nesting platforms and artificial ponds for amphibians. The authors report several difficulties and required changes to the initial plans but also highlight the potential of the implemented actions for education programmes and activities related to nature conservation.

Paper C3-307 TasNetworks' strategy to mitigate the impact of power lines on threatened birds: This paper reports the development of a Threatened Bird Strategy with the aim to reduce the impact of transmission and distribution power lines on threatened birds. The strategy included three core components: building knowledge and awareness, mitigating infrastructure risk, and voluntarily offsetting residual impact. The strategy uses a collaborative approach including partnering with key external stakeholders and community engagement. The authors report the advantages of this strategy, including more accurate reporting to regulating authorities, improved company environmental knowledge, and a reduction in bird incident (outages) numbers.

b) Monitoring methods to assess mortality impacts

Paper C3-302 Video monitoring to study the behaviour of birds on a marked overhead line and to determine the risk of collision: Monitoring systems using video cameras are one of the possible approaches to study the behavioural responses of birds to power lines and detect collision events. This paper reports the results of one-year tracking of a 380 kV line span (400 meter) using this technology. The observed number of line crossings was unexpectedly high (over 4000) and five collisions were registered, mostly large birds.

Paper C3-305 Evaluation of monitoring practices related to the impacts of overhead transmission lines on birds in Portugal: suggestions for improvement: This paper reports a review of the practices adopted in the last decade within the scope of monitoring programs to assess the impact of overhead transmission power lines (150-400 kV) on birds in one European country. The authors found: that the objectives of monitoring programs are often not clearly defined; that there is a huge diversity of methods used by consultants in the different activities, often with methodological limitations and hindering the comparison of results across different projects; the reporting of the results is often incomplete, with implications for replication of methods in other studies and usage of these results in a scientific context. A series of suggestions to minimize these problems are given.

c) Procedures for impact mitigation

Paper C3-303 An overview of the problematic bird species and bird deterrent methods used in Japan: Birds can be the cause of outages and damage to transmission power lines and towers. This paper reports the results of a survey to TSO in order to identify the set of bird species causing problems in Japan and characterize TSO management responses, mainly in terms of adopted deterrent methods. Crow nesting was identified as the main problem for TSO, although herons and starlings are also a source of problems. The authors reported that TSO in Japan remove at least 22000 bird nests every year. Contamination by bird droppings is also a frequent cause of consumer complaints. Different methods to mitigate these problems are used by companies, and their effectiveness is subjectively evaluated by maintenance workers. Finally, the paper reports an experiment to evaluate how crows respond to sound stimuli.

Paper C3-304 Development of Eco-friendly Electric Transmission Towers in KEPCO: This paper reports the development of a so-called “eco-friendly” transmission tower in Korea, supposed to be more attractive for local residents, and blend well into the surrounding environment. However, the link with wildlife issues is not made.

Next Generation Network - L. Martins. The Use of a Robot for the Installation of Birds Anti-Collision Device: This paper reports the development of a robot to apply anti-collision devices in line sections identified as potentially dangerous for birds, in an energized transmission line in Brazil. Advantages of using this robot are reported, including a reduction in the installation time, improving with the security of the personnel, and not requiring disconnecting the line and reduce operational reliability.

3.3 Questions to Preferential Subject 3

Based on the initial set of topics planned for PS3, the following questions can be proposed:

Q1: How to prevent damages or outages for generation, transmission, and distribution equipment from birds, rodents, or other species?

- Q 1.1: Paper C3-303 presents a series of approaches to mitigate bird related problems in electricity infrastructures. Evaluating effectiveness of these approaches is, however, often not supported by scientific evidence or scientific approaches. How can companies adopt more effective methods to estimate effectiveness of the mitigation measures they implement?

- Q 1.2: All papers: With the exception of papers C3-303 and C3-307, none of the papers specifically addressed this topic. How important is this issue (outages or damages caused by wildlife) for different companies, compared to other sources of outages and damages? Do you have specific policies to tackle this (potential) problem?

Q2: Which methods are used, and which data are needed to determine mortality?

- Q2.1: All papers: Paper C3-301 reports the implementation of a bird migration monitoring near a power line, using radar plus direct observations, which did not register any bird collision in a 3-year period. Do other TSO also have information on absence of avian collision in some of their power lines? Is this the rule or the exception?
- Q2.2: Paper C3-302 presents a study illustrating the use of video monitoring to determine the risk of bird collision with power lines. Do you think that video systems are powerful enough to detect collisions of smaller birds? What other problems have you found, and could these be tackled?
- Q2.3: Paper C3-305 presents a study making a critical evaluation of monitoring practices to evaluate bird mortality and provide a series of suggestions for improvement. How could a standard protocol for all these activities be created and implemented by different TSO? What should it include?

Q3: Which methods for mitigation are used?

- Q3.1: All papers: Papers C3-301 and C3-307 present an integrated plan for bird protection. Which components of these plans do you consider more important/ effective? Do other TSO also have this type of integrated approach for wildlife?
- Q3.2: Paper C3-304 presents a new “eco-friendly” transmission tower based on aesthetical aspects (from a human perspective), but with no links to biodiversity issues. Can pylons for biodiversity objectives, while tackling potential problems of damage to infrastructure, be designed?
- Q3.3: Paper Next Generation Network - L. Martins focus on the development of methods to the more cost-effective application of anti-collision devices in power lines. What experiences do other companies have, related to this topic?
- Q3.4: All papers: Paper C3-306 reports a series of activities developed as compensatory measures. To what extent compensatory/offsetting measures for projects with significant biodiversity impacts are adopted by/imposed to companies? Which are the major challenges/concerns from companies, related to these measures?