



John Stoop
Kindunos, The
Netherlands

Covid 19 and aerosoles, a convenient combination?

In the debate about virus transmissions, 4 primary modes are identified: transmission through direct contact, through indirect contact by contaminated surfaces, transmission through larger respiratory droplets and small airborne micro-droplets, the so-called aerosoles.

Despite compelling evidence that aerosoles may play at least a potential role in the transmission process, it is scientifically incongruous that the level of evidence to demonstrate airborne transmission is so much higher than for the other transmission modes. While at present, it is difficult to quantitatively compare and conclude which mode is the most significant pathway, engineering control and application of ventilation, filtration and purification are remain named by the WHO on 28 March 2020 as 'contrary claims and misinformation'. An airborne pathway is only not ruled out by the WHO as a means of transmission only in case of crowded and inadequate ventilation with prolonged exposure. Consequently, several countries -among which the Netherlands- did not acknowledge the signific role of airborne transmission and rely on vaccination, exposure modelling, personal protective equipment, rather than empirical laboratory experiments on airborne transmission pathways. Only very recent, 'field labs' have been conducted to explore the impact of Covid exposure in large crowded environments, such as football stadiums, theatres and shopping malls. There seems to be an unbalance in favour of allocation of scarce resources to surface disinfection, masks, and crowd behaviour control such as curfews. The recommended application of existing Building Permits however, was not designed for virus protection purpose, but focused on energy preservation, while maintaining air quality, user satisfaction and comfort standards.

There is little use made of air purifiers, both static, mobile or as personal protective equipment, despite a wealth of knowledge and experience in the SHE domain, medical health care, clean room production technology and biological warfare.

In these domains, the dangers of indoor contamination of spaces is well known. The accumulation of exhaled viruses may cause secondary infections by serving as 'infection hotspots'. Recirculation without adequate filtering, ignorance about flow patterns, room size and positioning of the population at risk in relation to the airflow and a low ventilation rate due to energy preservation purposes are hardly investigated. At the same time CO2 as an indicator of air quality provides only an indirect measure of Covid exposure due to the absence of a Covid-CO2 correlation. There is no primary detection and measurement technique for the Covis virus, while threshold values for dose-effect relations are unknown. Scientific research indicates a threshold value of about 700-1000ppm as limit, while infection doses are unknown and infectious areas such as lungs and nose respond differently to the exposure with the virus. Several scientific papers indicate a success rate in experimental elimination of the virus as such by about 99% by combining ventilation with outdoor air supply, high ventilation rates and filtration and purification techniques based on UV-C light. Several papers advocate experiments with mobile, personal based units of purification, additional to expensive and large stationary ventilation and air quality control systems.

In conclusion, standard solutions in mitigating exposure to the Covid virus are not designed for this purpose. They do not prevent a next wave in the pandemic. Cutting of exposure at the source by capture and killing the virus are a more fundamental approach, in which airborne transmission by aerosoles cannot be ignored any longer. Present ventilation and indoor climate control systems are not designed for Covid mitigation due to their energy preservation and recirculation principles. There is a window of opportunity for an engineering and risk management approach, based on principles unfamiliar to the medical, virological and immunological community.

More about: www.behouderfgoeddevr.nl



ESReDA President
Mohamed Eid
RiskLyse, France

Resilience: lessons learnt from the incident of 8 January, at 14:05 CET

On Friday, 8 January 2021 at 14:05 CET, the Continental Europe Synchronous Area was separated into two zones (the North-West zone and the South-East zone) because of the cascaded trips of several electrical power transmission network protection systems. These cascaded trips were the consequences of the overall pan-European flow pattern on the afternoon of 8 January 2021. On that afternoon, the Continental Europe was separated into two climatic distinguished zones: South-East and North-West, Figure 1. In the SE zone, the combination of a warm weather in the Balkan Peninsula and the Orthodox Christmas holiday on 6 and 7 January led to an overall lower demand of electricity. While the N-W zone was experiencing a cold weather and consequently higher demand of energy. The disequilibrium in load distribution induced a power deviation in the network that results in a system frequency offset generated by the kinetic energy of the rotating power generation units. Increasing demand decreases the system frequency and decreasing demand increases the system frequency, Figure 2. The set point of the EU system frequency is 50 Hz and frequency offsets should be in the range of ± 0.1 Hz.

To countermeasure the underfrequency in the North-West zone, the contracted interruptible services in France and Italy, with a total of 1.7 GW, were disconnected in order to reduce the frequency deviation. These countermeasures kept the frequency offset within the limit of -0.1 Hz, by 14:09 CET, see the blue line in Figure 2.

On the other hand, automatic and manual countermeasures were activated to reduce the large over-frequency in the S-E zone. Thus, the frequency offset in the S-E zone could be lowered to $+0.1$ Hz by 15:05 CET, see the red line in Figure 2.

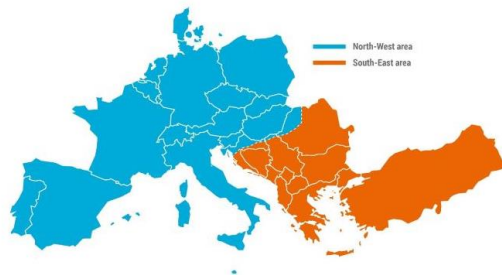


Figure 1

The synchronous area of Continental Europe on January 8th

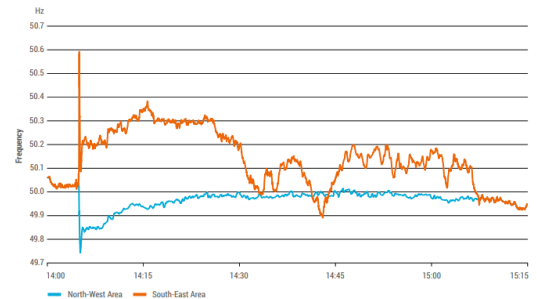


Figure 2

Frequency development with time

Due to the fast and coordinated approach, no major loss of load or damages were observed in the power system.

This pan-European flow pattern has already been forecasted with the existing security procedures like Day-Ahead-Congestion-Forecast (DACF) or Intra-Day-Congestion-Forecast (IDCF) as well as in (n-1) simulations.

Waiting for the release of the incident investigation final report, one may point out the 3 major lessons that impact on the resilience of any system, critical or not: the use of advanced ICT and smart control systems, the development of robust predictive Modelling & Simulation capabilities, and the build-up of a reactive and coordinated decisional organisation.

For more technical details, you may download the [interim report](#).

ESReDA WEBINARS



Siegfried Eisinger
DNV GL, Norway

As a starting point for the ESReDA Project Group on **Big Data, Reliability, Risk and Safety Analysis** the 57th ESReDA workshop in Valencia was conducted. After the seminar the focus area of the PG was still not clear and the number of interested parties to contribute to the PG was rather low. As a first step a **webinar series Trustworthy Complex and Intelligent Systems** was launched with DNV and ETH Zürich as organisers and NorwAI and ESReDA as partners.

In January 2021 we started off with former Turing Award winner Joseph Sifakis talking about why it is so hard to make self-driving cars, or trustworthy autonomous systems in general. One of his most important conclusions was that we cannot make such systems if we do not manage to add 'understanding' to recent wins within Artificial Intelligence (data-driven) systems.

In February we followed up with DeepMind member Peter Battaglia talking about structured models of physics, objects and scenes. In his talk he showed some striking examples of recent progress in this interesting field of graph neural networks.

The latest presentation was given by Asun Lera and Andre Ødegårdstuen (both DNV) about trustworthy industrial AI systems. With her background in Social Sciences Asun pointed out that trust is not mainly a technical issue but more a 'social contract'. It is high time that all involved parties take this serious and learn how we want to use AI techniques and how not.

On **30th April Martin Vechev** from **ETH Zürich** will talk about **the latest progress in the field of certifying deep learning systems**.

Towards the summer we are looking forward to the presentations by **Øyvind Smogeli (ZeaBuz)** talking about **a recent application of an autonomy in a city ferry system**, where trust represents a crucial basis for the business. In **June Enrico Zio** from **Polytechnico Milano** will talk about **Prognostics and Health Management for condition-based and predictive maintenance**. He promises a look in and a look out.

We plan to continue the webinar series through the summer and autumn. If ESReDA members have tips about interesting persons and themes which could fit, please do not hesitate to let us know. The presentations will be announced beforehand both on our web-pages and as e-mail. It would also be good to get your feedback with respect to whether this is interesting and valuable and what could be improved. Siegfried.Eisinger@dnv.com is the contact person to write to.

Forthcoming ESReDA SEMINARS

The 58th ESReDA Seminar



Kaisa Simola
EC JRC Petten,
The Netherlands



Zdenko Simic
EC JRC Petten,
The Netherlands

The 58th ESReDA Seminar on Using Knowledge to Manage Risks and Threats: Practices and Challenges

Updated dates: 15-16 June 2021, Alkmaar, The Netherlands

The 58th ESReDA Seminar on Using Knowledge to Manage Risks and Threats: Practices and Challenges will be held on 15-16 June 2021, virtually hosted by [European Commission Joint Research Centre](https://ec.europa.eu/jrc/en/about/jrc-in-brief) (EC JRC, <https://ec.europa.eu/jrc/en/about/jrc-in-brief>).

The 58th ESReDA seminar will be a forum that aims to discuss theories, concepts, and experiences of enhancing the use of knowledge for better risk management and governance. This seminar will bring together researchers, practitioners, specialists and decision-makers to discuss strategies and practical experiences.

Five key notes and 28 abstracts for the seminar are submitted from various stakeholders, from practitioners to researchers (industrialists, regulators, safety boards, universities, R&D organisations, engineering contractors and consultants, training specialists).

Papers submission is open till **15th of May 2021** at [Easychair](https://www.easychair.com).

The **registration** is open till 15th May 2021 on the [JRC website](https://ec.europa.eu/jrc/en/event/webinar/58th-esreda-seminar-using-knowledge-manage-risks-and-threatspractices-and-challenges).

More information, including tentative agenda, is available here:

<https://ec.europa.eu/jrc/en/event/webinar/58th-esreda-seminar-using-knowledge-manage-risks-and-threatspractices-and-challenges>

Contact email address for all questions about seminar is jrc-esreda58seminar@ec.europa.eu.

The 59th ESReDA Seminar



Agnieszka Tubis
Wrocław University of
Science and Technology,
Poland

The 59th ESReDA Seminar on Creating Safe and Resilient Logistic Systems 26-27 October 2021, Wrocław, Poland

The 59th ESReDA Seminar on Creating Safe and Resilient Logistic Systems will be held on 26-27 October 2021, hosted by Wrocław University of Science and Technology. In a case Covid19 situation prevents full physical meeting, hybrid and fully virtual options will be considered.

The Seminar aims to discuss theories, concepts, and experiences of enhancing the use of knowledge for better reliability, resilience, and risk management. The presented research results, operational proposals, and case studies will respond to enterprises' managerial staff's current problems throughout Europe. Thus, this Seminar will bring together researchers, practitioners, specialists, and decision-makers to discuss strategies and practical experiences in the given field of research. The main topics include (but are not limited):





Tomasz Nowakowski
Wroclaw University of
Science and Technology,
Poland

- Designing reliable logistics networks;
- Risk assessment and decision theory in transport and logistics systems;
- Safety and quality in transport and logistics
- Supply Chain Risk Management
- Physical asset management under risk and uncertainty
- Resilience of logistic systems and supply chain
- Threats in Logistics 4.0
- Submission of abstract before 15 June 2021

The **call for papers** will available on the ESReDA website very soon.

The registration will open from 1 June 2021 till 30 September 2021. A registration form and information package for the venue will be made available on the ESReDA website. Contact email address for all questions about seminar is sylwia.werbinska@pwr.edu.pl or emilia.skupien@pwr.edu.pl.

Project Groups



Zdenko Simic
EC JRC
Petten, The Netherlands

Project group on “Risk, Knowledge and Management” had 3rd virtual meeting on 25th March 2021

The Project Group Risk, Knowledge and Management launched in November 2020 held its 3rd plenary meeting on 25th March 2021. This RKM PG is led by Dr. Zdenko Simic (zdenko.simic@ec.europa.eu) from the European Commission Joint Research Centre (EC JRC, <https://ec.europa.eu/jrc/en/about/jrc-in-brief>) in the Netherlands and the RKM PG secretary is Eric Marsden (eric.marsden@foncsi.org) from FonCSI (<https://foncsi.org/>) in France.

This PG is focused on the intersection of risk, knowledge and management in different domains. The 3rd meeting was attended by 13 participants, from about 20 who have expressed their interest to work in the RKM. Work on how knowledge management could improve prevention of accidents with better use of lessons learned from previous events (eg. Boeing 737MAX, BP Texas City, Fukushima and Covid-19) is progressing. It was agreed in the meeting that the group will work following both a horizontal (topic-based) and vertical (case-study based) approach.

The RKM PG is going to support organisation of the virtual 58th Seminar on Using Knowledge to Manage Risks and Threats: Practices and Challenges planned for 15-16 June 2021 and hosted by the EC JRC.



Rasa Remenyte-Priscott
University of
Nottingham, UK
The Netherlands

PG on Resilience Engineering and Modelling of Networked Infrastructure

Many of the critical infrastructure systems on which modern society is so dependent are networks. These include transport networks (rail, metro, highway, air traffic and shipping routes), utilities (electricity, gas, water) and communications (mobile phone, land line phones, internet). The disruption of such systems can have a big impact on the communities that they serve. The nature of the threats to these systems is also changing and includes failures, especially of aging infrastructure, natural disasters, the effects of climate change and deliberate acts such as terrorism. Such critical systems need to be resilient.

This project group, now in its third year, and with a base of 35 members, is focussing on the transport and utilities networks to keep the project manageable over three years. For these sectors we are looking at the characteristics of each of the networks and the methods which exist to model their resilience and identify the weaknesses where the most effort should be expended to protect the performance of the network.



John Andrews
University of Nottingham,
UK

There is a potential for follow on project groups to investigate networked systems in other sectors. The Project Group main objectives are:

- To develop a forum by which the leading researchers from both academia and industry can meet, exchange ideas and where appropriate work together on projects relevant to the area of Resilience Engineering for Networked Systems.
- To produce a technical reference text which will document the current state-of-the-art along with the advances made over the duration of the project in the aspects of Resilience Engineering that have been the focus of the work. Papers are currently being collated and reviewed, for publication of the book in 2021.
- To disseminate the work conducted emphasizing its practical application at the 60th ESReDA seminar, to be held in Spring 2022, Université Grenoble Alpes, France.
- To organize special sessions at International Conferences, with the next session: "[Advancements in Resilience Engineering of Critical Infrastructure](#)" at ESREL 2021, 19-23 September 2021, Angers, France.

Our PG meetings have successfully moved online due to COVID-19 disruption. Our last meeting on the 2nd December 2020, was attended by 21 of our contributors via Microsoft Teams, and in addition to sharing news and updates we welcomed a detailed presentation from Dr Sadeeb Simon Ottenburger, Karlsruhe Institute of Technology (KIT), Institute for Thermal Energy Technology and Safety (ITES), on "Smart Resilient Power Distribution".

Joint Project group Leaders:

- Dr Rasa Remenyte-Prescott, University of Nottingham,
- Professor John Andrews, University of Nottingham.

Project group Secretary – Kate Sanderson, University of Nottingham ([mail to contact](#)).

ESReDA Members' activities

IRSN, France

What can be learned from the accident of Fukushima Daiichi to make nuclear facilities more robust and able to withstand extreme events and to improve post-accident management? In a report entitled "Anticipation and resilience: considerations a decade after the Fukushima Daiichi accident", IRSN's experts share their insights regarding this challenging and complex subject.

The different chapters address:

1. [Experience feedback: a wealth of information which must be better used](#)
2. [Robustness of facilities and ability of personnel and organizations to respond to unexpected situations](#)
3. [How can we plan for the risks inherent to combined malfunctions or events considered as highly improbable?](#)
4. [Recovery after a nuclear accident: an essentially societal process](#)
5. [Populations after the evacuation](#)
6. [Emergency exercises, limits and opportunities](#)

[Click here to read more.](#)



University of Nottingham, UK

Next Generation Prediction Methodologies and Tools for System Safety Analysis

The Resilience Engineering Research Group (leaders of the ESReDA Project Group "Resilience Engineering and Modelling of Networked Infrastructure"), formerly known as the Centre for Risk and Reliability Engineering, was created in 2010 when the University of Nottingham joined forces with the Lloyd's Registry Foundation (LRF) to launch a Centre of Excellence in the field.

[Lloyd's Register Foundation](#) is an independent global charity that supports research, innovation, and education to make the world a safer place.

Our latest project funded by LRF, "Next Generation Prediction Methodologies and Tools for System Safety Analysis", will develop the next generation of software tools to perform risk assessments for safety critical systems.



University of
Nottingham
UK | CHINA | MALAYSIA



Lloyd's Register
Foundation

The foundations of current risk assessment tools and methodologies for safety critical systems were established in the 1970s. Research has made considerable advances in the capabilities of analytical techniques since then. In addition, technology has advanced and system designs, their operation conditions and maintenance strategies, are now significantly different to the sorts of systems that existed in the 1970s.

The challenge of this 5 year project is to account for all of these factors in developing a single methodology appropriate to meet the demands of modern industrial systems and, with the support of [Lloyd's Register](#) in Sweden, implement them in a software tool that has the potential for wide distribution and impact. The tool, accompanied by comprehensive documentation, could be adapted by users to reflect the needs of their system assessment.

The objective of the research is to produce a new, generic, approach to system failure modelling which will enhance the currently used risk analysis methods: Event Tree Analysis and Fault Tree Analysis, which were developed back in the 1970s and have limitations in terms of their applicability to modern systems. The new approaches developed will introduce the following features:

- Component failure and repair times represented by any distribution
- Dependencies between component failure events
- The ability to model complex asset management strategies
- Representation of the full range of component failure modes and degraded states
- Phased maintenance periods
- Incident dynamics
- Modelling journeys (phased missions) in addition to system lifetimes
- Incorporation of resilience concepts
- Integration of the stochastic failure processes with the deterministic models of the engineering system performance.

Industrial collaborators on the project include: Rolls-Royce (Aerospace and Nuclear), High Speed 1, High Speed 2 Network Rail and Network Rail High Speed, RSSB, Indira Gandhi Centre for Atomic Research (IGCAR), Bhabha Atomic Research Centre (BARC), and First Group.

For more information on the project please contact: [Kate Sanderson](#).

National Centre for Nuclear Research, Centre for Hazard Analysis MANHAZ, Poland

Challenges for safety and reliability of the foreseen HTR-based Nuc-Chem facilities

Current trends in modern energetics are focused on the reduction of the CO₂ emission of the electrical power units. However, electricity is only a smaller part of the industrial energy demand. Most of the CO₂ emitted to the atmosphere is from the process heat and transportation, which are almost 100% satisfied by fossil fuels. For that reason, the non-electrical applications of nuclear technology are becoming so attractive. One promising perspective is the implementation of the High Temperature Reactors (HTRs) within the non-nuclear facilities (e.g., chemical plants for performing industrial heat processes or hydrogen production plants for fuelling the future eco-transportation system). Integration of the nuclear and non-nuclear systems leads, however, into complex Nuc-Chem facilities with specific safety characteristics. It requires, in turn, many efforts aiming at ensuring the safety, reliability, and profitability of such a hybrid technology.

This is the case of Poland, where the implementation of the HTRs is considered. In 2017 Polish Ministry of Energy has published a report on the possibilities for deployment of the HTRs in the Polish industry. The report contains an assessment of the domestic demand for the process heat and the analysis of possibility to meet these needs with HTRs. It also indicates that deployment of HTRs in the largest heat recipients, located across the whole country (chemical and energy companies), would be justified by economics (operating costs compared to current costs of technology based on coal/gas), nationwide energy policy (reduction of gas import dependency), and environment protection (lower CO₂ emission).

The licensing process is now one of the most burning challenges. It must be carried out with respect to all specific features of nuclear technology and the related chemical installations. It could be performed separately for the neighbouring nuclear and chemical parts, assuming different regulatory bodies and safety reports. This approach, however, would not reflect the real characteristic of the integrated Nuc-Chem facilities. That is why an integrated safety and reliability analysis is considered. Such an approach would have many advantages, among others, one decision-making body and one report covering all safety aspects of nuclear and chemical parts consistently. It requires, in turn, an integrated risk assessment for the whole installation, which means consideration of insights coming from the chemical and nuclear part, including their

interdependencies and different time scales of the chemical and nuclear processes. However, the application of the commonly used methods, like event trees and fault trees, can significantly reduce the potential benefits of the integration due to: (1) numerical ineffectiveness of large and complex event/fault tree structures; (2) multiple modelling of the same sequences of events appearing at a different time; and (3) difficulties in adding new systems, interactions, or time frames to the models. Moreover, the chemical facilities contrary to HTRs, have a long operational experience. The technology and production processes are known very well. The maintenance strategies are already elaborated and proven. The reliability data banks exist. On the other hand, the HTR technology is currently in the design or even the pre-conceptual phase. Thus, the reliability study for this kind of reactors is a great challenge due to the novel technological concepts for which neither the damage states, safety goals nor risk measures are clearly defined. There are no reliable datasets for components operating in this specific range of temperature, which is characteristic for the HTRs. Many other challenges can be specified as well, that are beyond the technical or methodological issues, e.g. the differences between nuclear and chemical business in safety culture, knowledge management, or decision-making processes.

This opens a new field of research in safety and reliability engineering of complex systems, thus creating a perspective for improvement of the existing methods and models for better estimation of the risk and reliability of the nuclear-chemical facilities. A current research objective in this field relates to the identification of the potential hazards posed by the Nuc-Chem systems and the fragility of their mutual interdependencies. New developments are highly expected towards ensuring the safety and profitability of the foreseen chemical installations with the high temperature nuclear reactors.

Contact: karol.kowal@ncbj.gov.pl

Forthcoming Conferences & Seminars



Rasa Remenyte-Prescott
University of
Nottingham, UK

11th IMA International Conference on Modelling in Industrial Maintenance and Reliability **28 June - 2 July 2021, online conference via Zoom**

The 11th International Conference on Modelling in Industrial Maintenance and Reliability (MIMAR) will take place virtually via Zoom from 28 June – 2 July 2021. This event is the premier maintenance and reliability modelling conference in the UK and builds upon a very successful series of previous conferences. It is an excellent international forum for disseminating information on the state-of-the-art research, theories and practices in maintenance and reliability modelling and offers a platform for connecting researchers and practitioners from around the world.

If you would like to attend this event registration is now open on [MyIMA Portal](#).

Please note that each day of the event requires a separate booking.

The rates listed below are per day.

Non IMA Member – £35 per day

IMA Member – £25 per day

IMA Student – £10 per day

Non-Member Student – £15 per day

For further information on the conference, please visit the [conference webpage](#).



John Andrews
Co-Chair
University of Nottingham,
UK



Phuc Do
Co-Chair
University of Lorraine,
France



We hope you can attend.





André Lannoy
ESReDA Honorary
Member,
IMdR, France

**Activities and crises: risk professions facing the challenges of society.
What contributions and what questions?
16–17 November 2021, Paris, France**

2020 has been a year full of emotions. The Covid-19 crisis has thus changed our certainties, our lives and our working conditions. It has also helped to broaden our awareness of the new dynamics of contemporary crises.

This health crisis has been added to a long list of past and recent crises whose triggers, and even tipping points, have both been linked to accidents (e.g. Fukushima in 2011, railway accidents in 2013, Lubrizol in 2019, crash of airlines Boeing 737 Max 8 in 2019, ...), epidemics or pandemics (eg avian flu in 2005, SARS-Cov-2 in 2020,...), natural disasters (eg floods in Saint Martin-de-Vésubie (French Riviera) in 2020,...), cyberscandals (eg Cambridge Analytica in 2016), or even societal controversies (eg "gilets jaunes" movement in 2018). These new crisis dynamics encourage us to open the debate on the contributions and questions raised by the risk professions.

These Talks of Risk are intended to be the opportunity to bring together decision-makers from different industrial and societal fields, experts and researchers to discuss this issue.

For their 9th edition, the 2021 Talks of Risk will combine invited lectures and papers submitted to a reading committee. The authors are called upon to propose original communications on conceptual, methodological or practical reflections around the following themes in particular:

- feedback on crises and the Covid-19 crisis;
- the different configurations of contemporary crises;
- the impact of crises on the safety and security of industrial facilities, on complex socio-technical systems and on territories;
- anticipation and forecasting in a crisis situation;
- business continuity, adaptation and resilience;
- new forms of work;
- links between science, expertise, decision-making and public opinion;
- risk communication in times of crisis;
- role of the risk community in crisis prevention and management.

More about at [IMdR website](#).

Co-chairs of the program committee

Sylvie Garandel (ATRISC consultants)

Myriam Merad (CNRS - Paris Dauphine University)

**Other Conferences
and Seminars**

CYSENI 2021 – the 17th Annual International Conference of Young Scientists on Energy Issues

24-28 May 2021, Kaunas, Lithuania. Call for papers at the [CYSENI website](#).

SSARS 2021 – 15th Summer Safety & Reliability Seminar

5-9 September 2021, Ciechocinek, Poland. More about at the [SSARS website](#).

ESREL 2021 – the 31st European Safety and Reliability Conference

19-23 September 2021, Angers, France. More about at the [ESREL 2021 website](#).

CRITIS 2021 – the 16th International Conference on Critical Information Infrastructures Security

27-29 September 2021, Lucerne, Switzerland. More about at the [CRITIS 2021 website](#).

ESReDA Members, you are kindly invited to contribute to the ESReDA newsletter sharing news, announcement of events, your experiences, ideas, etc. You are supposed to elaborate proposals to create new Project Groups, host ESReDA Seminars or initiate collaborative activities.

ESReDA: European Safety, Reliability & Data Association

Association internationale sans but lucratif, régie par la loi Belge du 27 Juin 1921-Titre III (Registration N°: 0452522618 - Siret:E00005802)

Headquarter: ESReDA, rue Gachard 88 Bte 14, B-1050 Bruxelles, Belgium

Contact ESReDA | info@esreda.org