ESReDA

European Safety, Reliability & Data Association

Newsletter

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A Full Value Chain Dialogue on Intelligent Railway Maintenance – Insights from the Gothenburg Workshop of ESReDA's DMAD Project Group

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On June 23–24, 2025, the city of Gothenburg hosted an international workshop focused on Advanced Condition-Based Maintenance (CBM) and Intelligent Maintenance in the Railway Sector. The event was co-organized by Chalmers University of Technology and the Digital Maintenance and Asset Digitalization (DMAD) Project Group of ESReDA, in collaboration with the University of Seville. This workshop marked a significant step forward in understanding how digitalization, data-driven methods, and artificial intelligence are reshaping the way we manage and maintain railway infrastructure and rolling stock. More than a technical meeting, it was a strategic exchange across the entire value chain, bringing together stakeholders who rarely converge in a single forum.

Participants included component manufacturers such as SKF, train integrators like Talgo, infrastructure managers such as Trafikverket (Swedish Transport Administration), operators including SJ (Swedish State Railways), technology providers such as IFS, and leading academic institutions from Sweden and Spain. At the heart of the discussion was a question posed by Chalmers: "How can we create smarter maintenance solutions for the trains of the future?" The workshop was structured to explore this from both technical and strategic angles. It became clear that while technologies such as sensor networks, machine learning, and digital twins are mature and widely implemented, real transformation requires coordinated frameworks, shared data environments, and a stronger alignment between operational needs and digital capabilities.

Several sessions highlighted the need to improve data accessibility and integration along the asset lifecycle, move beyond pilots to truly operational decision-making, measure progress using clear indicators of digital maturity, and orient efforts toward new service models that deliver value to users and society, not just internal efficiencies. These points resonated with the shared conclusion: intelligent maintenance must evolve from being a support function to becoming a strategic driver of safety, reliability, and sustainability in rail transport.

Special thanks go to SKF, and in particular Katarina Wising and her team, for hosting a memorable visit to their central facilities—an impressive example of a highly digitized factory. We also extend our gratitude to Chalmers University of Technology, especially to Professor Anders Skoogh and the SII-Lab (Stena Industry Innovation Lab), for providing not only technical leadership but also an outstanding organization and warm hospitality. This workshop leaves behind not just knowledge shared, but also a new momentum for European collaboration, and a model for connecting people, data, and purpose across the railway sector.

This initiative reflects the mission of ESReDA and its DMAD Project Group: to serve as a European platform for knowledge exchange, collaboration, and consolidation of impactful innovation in the field of maintenance and asset digitalization. By facilitating high-level dialogue between academia, industry, and public authorities, DMAD helps translate technological advances into actionable strategies for critical infrastructure.

*The **DMAD Project Group** is an **open initiative**, and we welcome new participants interested in digital maintenance, asset management, and infrastructure resilience. If you wish to join or learn more, please contact:* ***Antonio Sánchez*** *(antoniosh@us.es) or* ***Aitor Goti*** *(aitor.goti@deusto.es)*

What research reactors can teach us about equipment reliability assessment

By Dr. Karol Kowal
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Unlike commercial nuclear power plants (NPPs), research reactors are often unique in their design, operational modes, and objectives, which makes standardised approaches to reliability and safety assessment much more nuanced. Reliability and safety studies for commercial reactors are well-established and backed by decades of operational data. Research reactors have largely relied on generic data from international bodies like the IAEA or the U.S. NRC. And here lies the catch: research reactors are far more diverse in design and use, and their operational data are often sparse or inconsistent. A recent study has explored this issue, considering the MARIA reactor – a 30 MW-thermal multipurpose research facility, operated by the Polish National Centre for Nuclear Research (NCBJ) [1]. Several findings on the equipment reliability of such non-commercial facilities are worth sharing with the ESReDA community.

MARIA has been operational since the 1970s, supporting both scientific research and medical isotope production. As such, its components face operational demands closer to those of commercial facilities than in typical research reactors. However, its unique design and operational modes cannot be compared with the loads and regimes of nuclear power plant equipment. The problem has been raised during the probabilistic safety assessment on which source of the component reliability data is more representative for MARIA – the IAEA dataset collected from a group of research reactors, or the U.S. NRC data averaged from the commercial power plants. To consider this issue, over 20 years of failure records from MARIA's equipment have been analysed, comparing them to the databases maintained by the IAEA and the U.S. NRC.

Key Finding #1: Generic data can be misleading

The study showed that MARIA's equipment reliability exceeds the standards of research reactors based on the IAEA data, but stays below the statistics of the U.S. NRC, representing the commercial trends. The selected equipment of the MARIA reactor, for which the data was available, is generally more reliable than the IAEA average, but not quite up to par with commercial plant data. This duality challenges the default use of either data set when designing or upgrading safety systems in research reactors. Using one data source over another can significantly impact probabilistic safety assessments, and by extension, safety classification decisions. For new facilities, especially, the choice of reliability data could result in either increased costs or underestimated risk.

Key Finding #2: Integrated data may offer better insights

To deal with the differences between the IAEA and U.S. NCR statistics, an Integrated Reliability Data Aggregation (IRDA) method has been proposed. It aims to get information from the operational records of the reactor (often very limited), as well as the IAEA data, and U.S. NRC statistics. By using Monte Carlo simulations and expert-driven weighting methods (like Value Tree Analysis), the multi-source combined reliability estimates can be created to better reflect the realistic conditions. The IRDA approach ensures that no single data source fully determines the results of PSA. Instead, it accounts for the uncertainty and diversity of component behaviour across different reactor types, allowing more tailored and accurate analysis.

Key Finding #3: Real data can shift safety-related decisions

Perhaps most significantly, the study demonstrated how site-specific reliability data can impact the safety class assignments. In MARIA's case, the actual failure data caused some postulated initiating event (PIE) frequencies to increase enough to push some failure scenarios into a higher risk category. Although this didn't change final safety classes in the studied cases (due to already being high), it shows the process is sensitive to data input. This highlights the value of maintaining detailed, high-quality operational records, especially for facilities where even small changes in assumptions can influence the safety-related decisions.

Conclusions

The case of the MARIA reactor can be considered from a wider perspective. It is a call to rethink an approach to equipment reliability estimation for the non-commercial unique nuclear facilities. When the global nuclear research community explores new advanced reactors and fusion systems, the lessons from the 50-year-old MARIA may be highly relevant. For practitioners, regulators, and designers, the message is clear: do not rely solely on generic data, utilise operational experience wherever possible, and invest in methods (like IRDA) that can aggregate and refine multiple sources of data.

Reference

[1] J. Kałowski, K. Kowal, R. Laskowski, G. Mrugała, Impact of equipment reliability on safety classification of research reactors, Nuclear Engineering and Technology 57 (2025) 103388. DOI: https://doi.org/10.1016/j.net.2024.103388

Call for Expressions of Interest: ESReDA's Open Data Initiative

Dr. Manuel Chiachío
University of Granada, Spain

Dr. Manuel Chiachío
Associate professor

Developed countries are facing a nascent digital revolution fueled by human-like artificial intelligence, bioinspired engineering, and deeply intelligent robots, where humans and digital assets will work together within a large smart ecosystem.

The built environment, particularly industrial and civil infrastructure, will certainly be part of this revolution since infrastructures (roads, railways, cities, energy facilities, etc.) are the foundation upon which this future smart ecosystem will be based. Deep integration of smart technologies into infrastructure has the potential to reduce European spending on infrastructure asset management while significantly increasing reliability and resilience.

However, achieving this advanced level of digitalization requires learning from and responding to high-quality data. The creation, updating, and refinement of predictive models for smart digital twins demands substantial amounts of high-value data.

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Anyone working with digital twin technologies may already recognize the limitations posed by insufficient data to train and test these systems effectively. When available, data are often siloed within specific applications or components, making it difficult to use for training decision-making models across pervasive systems commonly found in industry and infrastructure.

In light of this, this is an opportunity for ESReDA to become a key player in providing open, high-value datasets related to asset management, reliability, and maintenance of physical and digital assets across various industries.

Call for Expressions of Interest: To all ESReDA members and EU experts in the field, if you are willing to participate actively in the **Open Data Initiative**, please, send your expression of interest to Dr. Manuel Chiachío (mchiachio@ugr.es) and Dr. Antonio J. Guillén (ajguillen@ucm.es).

Call for Expressions of Interest:

I-Risk Initiative: To Build a European network in the field of natural mass-driven hazards

Julien Baroth
University of Grenoble-Alpes, (France)

I-RISK is a national network in the field of natural, mass-driven hazards. It gathers companies, research laboratories and universities working in the field of landslides, rockfalls, mudslides, torrential floods, and avalanches. I-RISK is placed under the auspices of the National Pole Infr@2050. I-RISK organises strategical workshops on various topics to increase the resilience against mass-driven hazards:

- management and resilience against exceptional natural hazards
- dynamic behaviour of structures subjected to natural hazards
- snow cover in the climate change context
- the role of water in landslides
- impacts of permafrost melting on mountain infrastructure.

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I-RISK also helps to adapt training offers responding to the needs expressed by the concerned Industrial sectors and end-users. It supports the development of specific and oriented training sessions for natural mass-driven risk practitioners and other stakeholders. The last two new professional educational offers and a summer school series were for Swiss I-Risk partners.

Besides, I-RISK conducts a series of webinars to shed light on, and share within the community, the tools and knowledge developed by the companies and the laboratories who are members in its national network.

Still, I-Risk is launching its new initiative to “Build a European network in the field of Natural Mass-Driven Hazards”.

Why this initiative

The initiative aims at:

- Promoting and stimulating interactions between research and private stakeholders.
- Extending the existing I-Risk Network to the European sphere to foster multi-collaborative EU actions between different EU partners.
- Contributing into the development and the design of technical standards and recommendations.

We recognize the necessity to build a European partnership to answer EU Research & Innovation calls for projects, regularly emitted by the EC. We are convinced that we should improve our collective practices by exchanging on the different above-mentioned goals, and especially by changing the scale at which we organize these exchanges.

Next steps and proposed organisation

Setting up a European network will start with a first exchange with all potential partners through brain-storming meetings and discussions to build up a common shared ambition.

The next steps, including the creation of specific working groups, will be structured according to the outputs of the preceding phase of exchanges and consultations with other EU entities who will express their interest. Basically, the timeline could be as follows:

- Regular meetings (video and face-to-face if necessary) between all the partners engaged in the network - about 3 per year to share information on specific actions of interest, opportunities to build projects, etc. One of these meetings will be devoted to the strategy purposes for the coming year, including specific events to be conducted and related funding matters.
- Workshops to work on a specific topic.
- Organization of specific events to disseminate and share widely the problems encountered and the innovations obtained or participation of the collective in partner events.

Expression of interest

To all ESReDA members and EU experts in the field, if you are interested to get more information or want to contribute to the birth of the EU I-Risk Collaborative Network in the field of natural mass-driven hazards, please, contact julien.baroth@univ-grenoble-alpes.fr, with i-risk@i-risk.fr in Cc.

Forthcoming ESReDA Seminars

67th ESReDA Seminar

Trustworthy Complex and Intelligent Systems
September 25th – 26th, 2025, DNV Headquarters, Oslo (Norway)

Pr. Siegfried Eisinger

DNV, Norway

Siegfried.Eisinger@dnv.com

Scope

We are pleased to announce this 67 th ESReDA seminar dedicated to exploring the challenges and solutions associated with developing and deploying trustworthy complex and intelligent systems. The seminar will delve into various aspects of building and managing trustworthy systems, focusing on the following topics:

- Autonomous Systems: Advancements and challenges in the deployment of autonomous vehicles, vessels, drones, and robots, emphasizing safety and trust.
- AI Agents: Issues related to trust and safety of agentic AI systems.
- Complex Industrial Systems: The use of modelling, simulation, and AI for understanding, controlling, or managing complex systems.
- Multi-Agent AI: Trust and safety issues in systems involving multiple AI entities.
- Ethical and Social Implications and Governance: Societal impacts and governance of intelligent systems, including privacy, bias, and ethical considerations.

Key Dates

- Registration Deadline (for participants): 05.09.2025
- Accepted Presentations Submission: 19.09.2025

Registration and Seminar Fee

A registration form and information package for the venue will be made available on the ESReDA website (https://www.esreda.org/).

The registration fees are €300.

Fees are to be paid by bank transfer only to ESReDA account:

Holder: ESReDA
Bank: BNP Paribas Fortis Bank, Boulevard Jamar 1 D, 1060 Bruxelles, Belgium
IBAN: BE69 0012 3728 1678
BIC: GEBABEBB
Subject: 67th ESReDA Seminar – Registration fees

For all your enquiries and demands of additional information, would you please use e-mail: Siegfried Eisinger (siegfried.eisinger@dnv.com) with Antonio Guillén (ajguillen@us.es) in Cc.

The 67th Seminar program and practical details will soon be available on ESReDA websit: www.esreda.org

68th ESReDA Seminar

Multidisciplinary Approaches to Resilience Assessment in Critical Infrastructures and Digital Systems
May 14th - 15th, 2026, ISMA University of Applied Sciences, Riga, Latvia

Brief description

Pr. Laila Zemite
University of Applied Sciences, Riga, Latvia

(Laila.Zemite@rtu.lv)

The evolving complexity and interdependence of critical infrastructures- alongside their growing reliance on digital technologies- pose unprecedented challenges for resilience assessment and management. As infrastructures become increasingly interconnected, the potential for cascading failures, systemic disruptions, and hybrid threats (both physical and cyber) demands a comprehensive, multidisciplinary approach.

The 68th ESReDA Seminar on "Multidisciplinary Approaches to Resilience Assessment in Critical Infrastructures and Digital Systems" aims to provide a platform for the exchange of scientific knowledge, practical insights, and methodological advancements related to the resilience of complex socio-technical systems. This seminar will explore the integration of engineering principles, information and communication technologies (ICT), risk and systems sciences, human and organizational factors, and public policy to advance a holistic understanding of resilience.

Building upon the outcomes of previous ESReDA seminars, this event will foster collaborative dialogue among academic researchers, industry practitioners, regulators, and other stakeholders. The seminar seeks to promote the development of rigorous, evidence-based frameworks and tools for resilience assessment and enhancement, in the context of increasing uncertainty, technological transformation, and societal expectations

For follow up and more details you may contact Prof. (Laila.Zemite@rtu.lv) with Antonio Guillén (ajguillen@us.es) in Cc

The 1st Call (DRAFT) will be soon available on ESReDA website

Past ESReDA Seminars

66th ESREDA Seminar
Transformative safety and resilience models in a smart digital and sustainable world
May 22nd – 23rd, 2025, University of Salento, Italy

Topic brief description

Several factors are contributing to increase dynamism and complexity of current approaches to prevent accidents and to guarantee business continuity: one critical factor to evaluate is the massive diffusion of digital technologies, which is forcing the adoption of new models to prevent accidents and to support more effective resilience models. Briefly, from one side, digitalization is characterized by a transformative potential mainly oriented to improve operational performance, reduce accidents and increase system reactiveness through several ways. One example could be related to the enabling effectively the potential of acquiring in real time and huge quantity of safety data – also related to early warning signals – which will be treated and analysed by AI models for extracting knowledge to prevent accidents. New risk management models and approaches are, thus, required. Moreover, from another side, digitalization is the source of new emerging risks,

e.g. due to the massive use of intelligent robotics systems interacting directly with humans (like collaborative robots), to the use of decision support systems (e.g. based on algorithmic management) that provide automatic feedback to humans, e.g. workers as well as safety managers and/or analysts.

Seminar short report

Pr. Maria Grazia Gnoni
Full professor
Innovation engineering Dpt.

Mariagrazia.gnoni@unisalento.it

The seminar has pointed out the contribution of digital technologies in transforming risk assessment and management as well as resilience in several industrial sectors and from different perspectives, such as from company point of views to researchers and institutions. Discussions have moved from the contribution of digital technologies in improving risk assessment models and in supporting prevention of industrial accidents; furthermore, studies about how to develop more human centric digital solution were also discussed and analysed in different industrial and service sectors. A special session was dedicated to the "Collaborative intelligence and human in the loop for the future of safety critical systems. A human cantered perspective."

The breakdown of the participants per EU country is shown in figure 1.

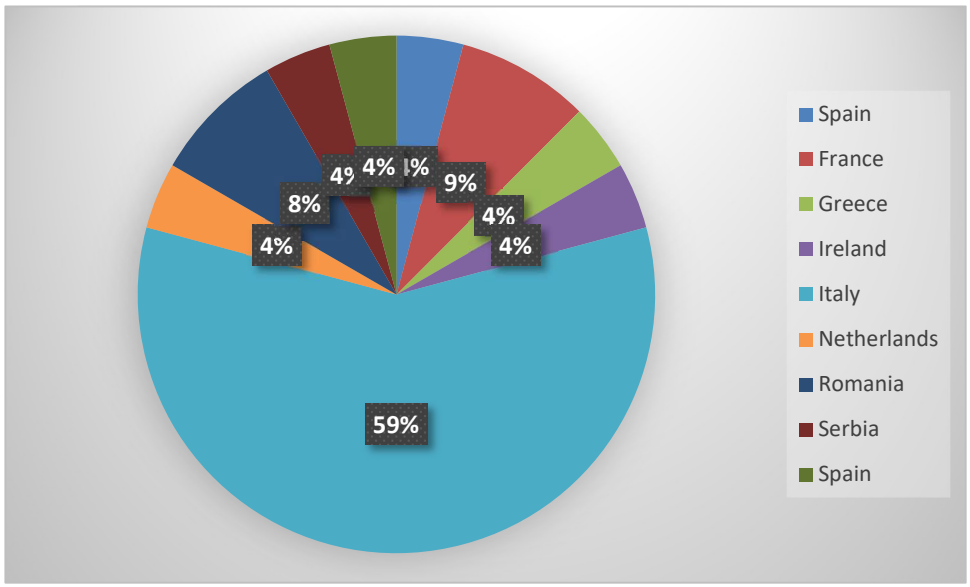

Figure 1: The breakdown of the participants per EU country

A multi-disciplinary audience (about 25 people) has participated to the seminar, i.e. from researchers, to company experts, as well as technicians from national institutions. The two-day one-session seminar has been organized in 5 sessions with 21 oral presentations, including 4 keynotes.

As follows some pictures of the seminar.

The official proceedings will be edited and available for free downloading within 6 months.

To follow up with this event, please, contact by mail Pr. Maria Grazia Gnoni (mariagrazia.gnoni@unisalento.it) and Pr. Antonio J. Guillén (ajguillen@ucm.es).

65th ESREDA Seminar

From risk imagination to safety intervention - Managing risks with knowledge, 14-15 November 2024, National Center for Scientific Research "Demokritos", Athens, Greece

Dr. Myrto Konstantinidou
National Center for Scientific Research "Demokritos"

myrto@ipta.demokritos.gr

ESReDA's 'Risk, Knowledge, Management' (RKM) project group (PG) addresses the intricate relationships between risk, knowledge and management, aiming to find new ideas for preventing accidents and improving safety management with better use of knowledge. The RKM PG organises the 65th ESReDA seminar to foster an exchange of ideas and expert debate. The National Centre of Scientific Research Demokritos in Athens will provide the forum.

Theories, concepts, and experiences of enhancing the use of knowledge for better risk analysis, management and governance were discussed between the gathered experts. The seminar has gathered some 60 participants: researchers, engineers, risk analysts and managers, and post-doctoral fellows, coming from different industrial and research sectors. During these two-day one-session seminar, about 21 oral presentations, including 5 keynotes, in 5 sessions were proposed.

The breakdown of the participants per EU country is shown in figure 2, below.

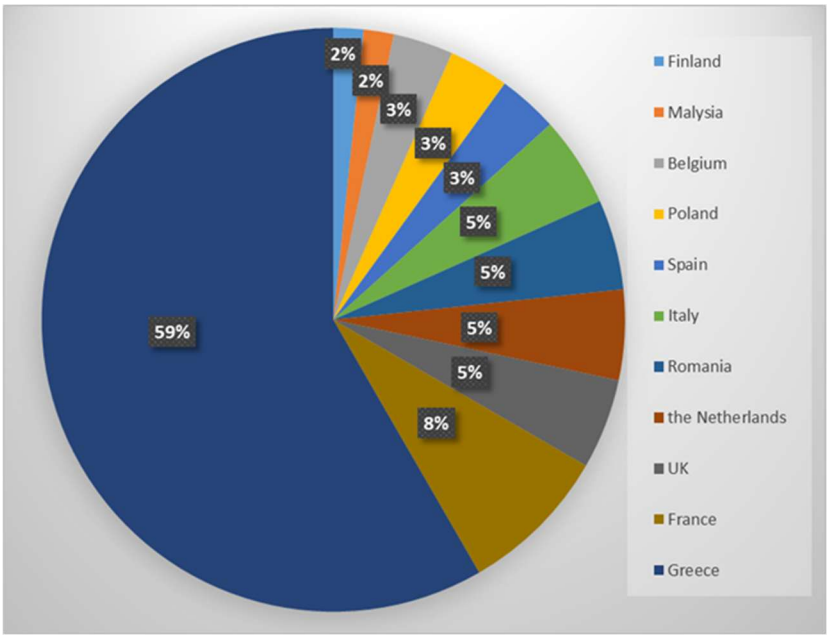

Figure 2: The breakdown of the participants per EU country

The seminar proceedings can be freely downloaded on the following link:

https://zenodo.org/records/15782946/files/ESREDA%2065%20Seminar%20Book.pdf?download=1

ESReDA Project Group on Risks, Knowledge and Management (PG-RKM)

In 2020, ESReDA launched a project group to address the relationships between risks, knowledge and management. The scope defined is of interest to system designers, operators, managers, maintenance, lawyers, insurers, regulators, and many others working on safety and security including natural hazard management. The scope covers the safety, reliability and security related to multiple hazards and threats (natural, high-risk industry, critical infrastructure, communication and transport systems over different territories etc.) involving all stakeholders (public, operators, regulators and government).

The ESReDA project RKM is successfully accomplished and the 65th ESReDA Seminar ends the activities of the project group. (see the new ESReDA PG AISS in the following sections)

New ESReDA Project Group:
Artificial Intelligence in Safety and Security (AISS)

By Dr. Sever Paul - chairperson of the PG
Agenția de Investigare Feroviară Română - AGIFER

A new ESReDA project group— Artificial Intelligence in Safety and Security (AISS)—has been given the go ahead. It will report in 2028.

The project group recognises that safety and security cannot be meaningfully separated in discussions of technology and its associated risks and benefits. The group won't create new AI tools, but will examine the added value and potential risks posed by AI to safety and security. Accordingly, these two domains will be considered jointly.

In this project, safety will be considered in the classical sense of industrial and occupational safety and security, rather than the existential risk to humanity (often referred to as "AI safety"). Accordingly, the project will look at the role of AI in safety and security from deep within the field of safety - and not looking at safety/security from the outside, the viewpoint of AI technology.

The objective of the project is to identify how AI—as both an enabling and disruptive force—is changing the world of safety and security. To this end, , the group will develop and share ideas aimed at helping national and international authorities (including those concerned with certification and assurance), private organisations, and third-sector bodies, as well as citizens and consumers, to harness AI effectively and responsibly.

The PG will develop a toolbox of principles and guidance to address questions such as:

- What added value can AI bring to traditional safety and security practices?
- How can we harness AI in the engineering design process without compromising integrity (Lawrence, 2023)?
- What practices and methods can support the development of trustworthy AI-based components and systems, particularly when handling vast amounts of data?
- What impact does unverifiable information (from influencers, social media, or AI-generated content) have on accident investigations? Can the introduction of real-world accident data into machine learning models assist investigations?
- How will AI and other emerging technologies shape the safety-security interface in law and society?
- In a world of unprecedented data volumes and increasing system interconnectivity, the dual nature of AI—as both a safety asset and a source of novel risks—defines today's technological landscape.

To be a net gain, AI in safety and security must be grounded not only in innovation, but in integrity, reflection, and understanding shared by everyone—and indeed everything—with a say in how our socio-technical systems work.

If you would like to join this Project Group please send an email to: Sever Paul - chairperson of the PG (sever.paul@agifer.ro) or to ajguillen@us.es (Antonio Jesus Guillen Lopez – ESReDA secretary).

For more information, please see https://zenodo.org/records/15736652

News from ESReDA Project Groups

ESReDA Project group on Resilience Assessment of Critical Infrastructure

The ESReDA project group on Resilience Assessment of Critical Infrastructure, active since June 2023, has organised two special sessions at the ESREL 2024 conference, held in Cracow, June 23-27, 2024. The special sessions are focused on resilience assessment in electricity sector (session 1) and critical infrastructures in general (session 2). The eight papers submitted are authored by the ESReDA members: JRC, University of Nottingham, Kaunas University of Technology & 'Horia Hulubei' National Institute of Physics and Nuclear

Vytis Kopustinskas
ESReDA PG Leader
European Commission, Joint Research Centre, Italy

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Engineering (the latter two applied for ESReDA membership in 2023) and ESReDA partners: University College Dublin, German Aerospace Centre, ETH Zurich.

ESReDA Project group on Resilience Engineering and Modelling of Networked Infrastructure

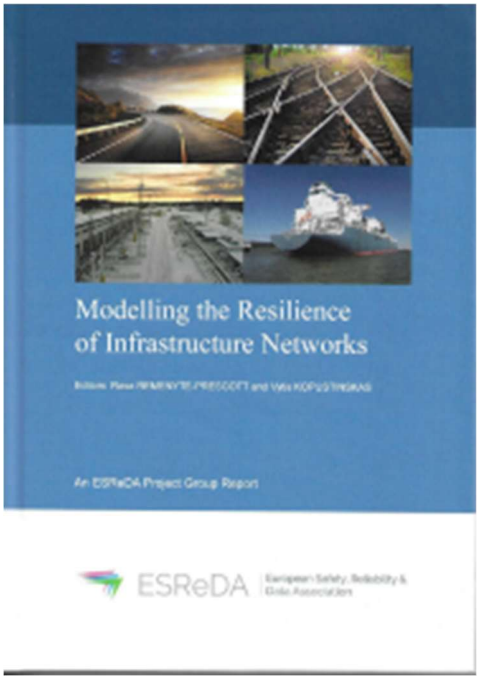
Rasa Remenyte-Prescott & John Andrews

University of Nottingham, UK

Findings from the project group have been published in a book entitled "Modelling the Resilience of Infrastructure Networks", edited by Rasa Remenyte-Prescott and Vytis Kopustinskas.

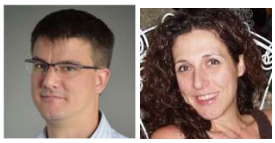
This book is a selection of contributions written by members of the Project Group and concentrates on the themes of transportation and utilities. The papers intend to provide an insight into the state of the art of resilience modelling with a focus on Networked systems. The book is aimed at both an industrial and academic readership with interests in the resilience of engineering systems.

We would like to thank the authors for their contributions to this publication, and our colleagues at DNV for their practical support with printing and distribution.



For information on how to purchase a copy please contact ajguillen@us.es ESReDA General Secretary, Antonio J. Guillén (Ingeman, Spain).

ESReDA RKM project group: Risk, Knowledge, and Management
(last actions before the end of the RKM project by the 65th Seminar, see above)



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Eric Marsden
eric.marsden@foncsi.org

The Risk Knowledge and Management Group is continuing its activities. During the last group meeting on the 22nd of February 2023 there was a shift-over of the Group Leader from Eric Marsden to Myrto Konstantinidou and an updating on the status of the discussion papers.

Currently, we have 14 discussion papers under preparation and another 6 under discussion. One is ready to be published in June 2023 and the rest will be published eventually until February 2024. The first one is entitled "Delegation of safety oversight" and it has been prepared by Eric Marsden. We are also planning to host a workshop and ESReDA Seminar in 2024, probably in Athens.

Delegation of safety oversight is a discussion paper on Risk, Knowledge and Management (RKM). It aims to share information on ongoing work undertaken in the context of the RKM project group.

The Delegation of Safety Oversight can directly be obtained from Eric Marsden (eric.marsden@foncsi.org).

ESReDA members' external running-projects

Medelia Chair: Probabilistic fatigue analysis of steel structures

The ageing of structures in France and around the world means that plant managers have to choose between several scenarios: extending their service life on an unchanged basis, repairs, reinforcements, or even complete replacement. The financial stakes are often very high, given manufacturing and

Julien Baroth, Associate Professor

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construction costs, as well as operating losses during shutdowns. As a result, plant managers need as much information as possible to assess the residual service life and level of risk associated with each of the above scenarios.

In this context, the Medelia Chair, sponsored by SPRETEC [1] (Artelia Group [2]), created by the Foundation Grenoble INP [3], aims to improve the safety and durability of hydraulic structures. It will focus on the study of steel welded connections in non-standard engineering structures such as hydroelectric power plants and dams. The Chair's researchers will be working on new fatigue calculation methods to improve models for predicting the service life of structures. This work will enable more accurate estimates of damage and service life, helping managers to make informed decisions.

Julien Baroth, associate Pr. at Grenoble-Alpes Univ., co-holder of this chair, has recently presented it during the 63rd ESReDA seminar in the JRC Ispra (IT), he will contribute to the project group « Resilience Assessment of Critical Infrastructure ».

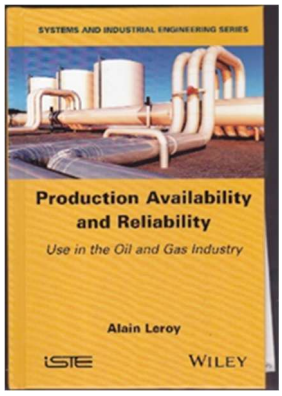
A thesis began in November, directed by Julien Baroth, 3SR [4], and Rafael Estevez , SIMAP [5], same university, with doctoral student Kamal Harb, entitled “Probabilistic fatigue analysis of mechanically-welded steel structures".

[1] https://www.spretec.fr/
[2] https://www.arteliagroup.com/
[3] https://fondation-grenoble-inp.fr/en/
[4] https://3sr.univ-grenoble-alpes.fr/en/3sr-lab
[5] https://simap.grenoble-inp.fr/en/about-simap

ESReDA community recommended books:

PRODUCTION AVAILABILITY AND RELIABILITY. Use in the Oil and Gas Industry.

Dr. Alain Leroy



https://iste.co.uk/book.php?id=1327

The aim of the book is to provide all the information requested for an efficient specification, assessment, follow-up and management of production availability and reliability characteristics of petroleum systems (upstream, midstream, downstream and petrochemical industries). However, nearly all parts of the book can be used in most of the industries, the “oil” taste being mainly on the examples of use provided. Whenever available proofs of validity of basic concepts (e.g. does the bathtub curve exist in the true life?) and of reliability assessments are given. Numerous true case studies are provided, all being based on author’s experience. The chapters are grouped in sections.

- Fundamentals are given in the first section. Definitions as well as mathematics are kept at the minimum vital. Nearly all the mathematics used in this book is given in Chapter 2. Basic formulae for assessing the availability and reliability of standard systems are given in Chapter 3.
- Modelling techniques are provided in Chapters 4 and 5 and Appendix 2. Failure mode and effects analysis, reliability block diagram, fault trees and Monte Carlo simulation are described in Chapter 4. Chapter 5 is dedicated to Petri nets, and Markov chains are given in Appendix 2. Comparison of results of calculations made using Markov chains, Monte Carlo simulation and Petri nets is provided in Appendix 3.
- Chapters 6, 7 and 8 explain the ways to obtain reliability data. One chapter on sources of reliability data (with a detailed description of the OREDA project since the beginning of the 80’s), one on methods for obtaining data from reliability tests and field and one on the use of expert judgment.
- Techniques that can be considered as a support to the other ones of the book are in Chapter 9. Origin of common cause failures and the existing methods for their analysis are presented and a review of existing data sources performed. Review of reliability engineering of electronics items and reliability engineering of mechanical pieces are the other topics considered.

- The methodologies for the assessment of system production availability and of system reliability characteristics are explained in chapters 10 and 11. Chapter 12 is on production availability and reliability management.

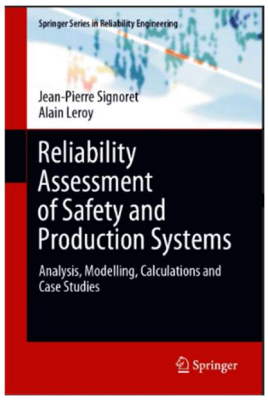
Alain Leroy started his career in an offshore engineering company then he joined a major oil and gas company. Within this company he was given the responsibility of developing and implementing tools of risk analysis, mainly gaseous explosion and heavy gas dispersion modelling as well as reliability engineering methods. He focused mainly on the implementation and use of novel approaches and techniques. He was chairman of the Steering Committee for the OREDA Interim Phase. Then he headed the engineering subsidiary of an insurance group. By the turn of the century, he funded and managed his own consulting company Fractal Systeme. He has delivered courses on reliability theory and practice at both basic and high levels.

Reliability Assessment of Safety and Production Systems Analysis, Modelling, Calculations and Case Studies

Jean-Pierre Signoret et Alain Leroy

This book provides, as simply as possible, sound foundations for an in-depth understanding of reliability engineering with regard to qualitative analysis, modelling, and probabilistic calculations of safety and production systems.

Drawing on the authors' extensive experience within the field of reliability engineering, it addresses and discusses a variety of topics, including:



https://link.springer.com/book/10.1007/978-3-030-64708-7

- Background and overview of safety and dependability studies.
- Explanation and critical analysis of definitions related to core concepts.
- Risk identification through qualitative approaches (Preliminary hazard analysis, HAZOP, FMECA, etc.).
- Modelling of industrial systems through static (fault tree, reliability block diagram), sequential (Cause-consequence diagrams, event trees, LOPA, bowtie) and dynamic (Markov graphs, Petri nets) approaches.
- Probabilistic calculations through state-of-the-art analytical or Monte Carlo simulation techniques.
- Analysis, modelling and calculations of common cause failure and uncertainties.
- Linkages and combinations between the various modelling and calculation approaches.
- Reliability data collection and standardization.

The book features illustrations, explanations, examples, and exercises – based on the demo version of the GRIF software (https://grif.totalenergies.com) – to help readers gain a detailed understanding of the topic and implement it into their own work. Further, it analyses the production availability of production systems and the functional safety of safety systems (SIL calculations), showcasing specific applications of the general theory discussed. Given its scope, this book is a valuable resource for engineers, software designers, standard developers, professors, and students. Issued in 2021, it is rather well received by the community of reliability engineers as more than 50 000 individual chapters had been downloaded at the end of 2024.

A MOOC in French (90 of course hours split in 4 units) has been developed from this book and issued in 2024 (https://seamonline.insa-toulouse.fr/). The English version is scheduled for the beginning of 2026.

Alain Leroy started his career in offshore engineering and was for ten years with the insurance industry. However, he has worked for most of his career in reliability engineering, focusing mainly on the implementation and use of novel approaches and techniques for assessing dependability parameters in the oil and gas industry. He has delivered courses on reliability at both basic and high levels.

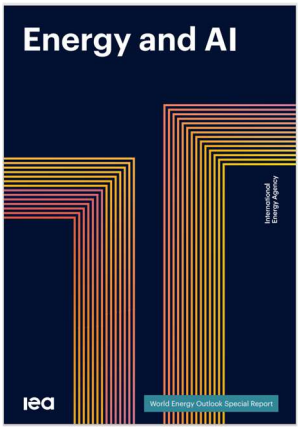
Jean-Pierre Signoret has been in charge of the research and development of methods and tools in reliability engineering, as well as of practical studies related to reliability modelling. He develops the first versions of the GRIF (Graphical Interface for Reliability Forecasting) software

continuously extended and improved over the past 40 years. He was former chairman of ESRA and vice-chairman of ISdF (French Institute for Safety and Dependability) now IMdR. He is still involved in the development of several international standards, including IEC and ISO, related to dependability, functional safety, reliability data collection, and production assurance. As a member of TPA (TOTALEnergies Associate Professors), he gives short courses in various universities on these topics.

Energy and AI

Special report by the INTERNATIONAL ENERGY AGENCY

April, 2025



(extracted)

In recent years, artificial intelligence (AI) has soared to the top of the political and business agenda. Once a mostly academic pursuit, it has evolved into an industry with trillions of dollars at stake. Despite significant uncertainties, it is now very clear: AI is coming. In many sectors, it is already here.

This has major consequences for the global energy sector. There is no AI without energy – specifically electricity. At the same time, AI has the potential to transform the sector's future. However, policy makers and the market have often lacked the tools to fully understand these wide-ranging impacts.

Recognising this gap, the International Energy Agency (IEA) stepped up to address it by leveraging our expertise in data collection and analysis, as well as our convening power, to inform and strengthen the global dialogue on these issues.

We began a new workstream on the nexus of energy and AI over a year ago, which has resulted in a series of key activities and outputs, culminating in this special report.

In December 2024, we held the Global Conference on Energy and AI, the largest international gathering on the matter to date, at our headquarters in Paris. It brought together policy makers, the tech sector, the energy industry and international experts to discuss the critical issues at play. This helped lay groundwork for the AI Action Summit, co-chaired by President Emmanuel Macron of France and Prime Minister Narendra Modi of India, in February 2025 – an event to which the IEA made crucial contributions.

This special report advances the conversation further. It is the first comprehensive global analysis examining all aspects of the links between energy and AI – from pathways to securely and sustainably meeting energy demand for AI, to how AI itself could transform the production, consumption and transport of energy around the world.

The analysis explores the implications of the rise of AI on energy security, investment, emissions and more – providing a strong factual basis for those thinking through the challenges and opportunities ahead.

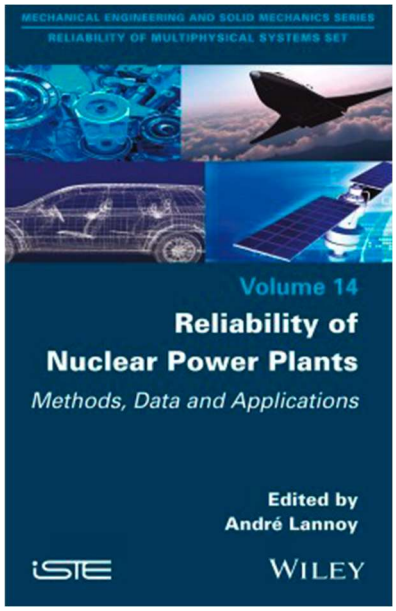
This report shows that electricity demand for AI is growing fast globally, even if other sources of demand are growing faster. In some parts of the world, the effects of AI on electricity systems are set to be very significant. With this in mind, we suggest three pillars countries should bear in mind as they plan for the future.

The full report is available at:

https://www.iea.org/reports/energy-and-ai

The report was designed and directed by Laura Cozzi, Director for Sustainability, Technology and Outlooks, of the International Energy Agency (IEA), in co-operation with other directorates and offices in the IEA. The lead authors and co-ordinators of the report were Thomas Spencer and Siddharth Singh.

Reliability of Nuclear Power Plants Methods, Data and Applications



Edited by André Lanoy, Abdelkhalak El Hami
Prposed by Jean-François Raffoux

Since the 1970s, the field of industrial reliability has evolved significantly, in part due to the design and early operation of the first-generation nuclear power plants.

Indeed, the needs of this sector have led to the development of specific and innovative reliability methods, which have since been taken up and adapted by other industrial sectors, leading to the development of the management of uncertainties and Health and Usage Monitoring Systems.

In this industry, reliability assessment approaches have matured. There are now methods, data, and tools available that can be used with confidence for many industrial applications. The purpose of this book is to present and illustrate them with real study cases.

The book addresses the evolution of reliability methods, experience feedback and expertise (as data is essential for estimating reliability), the reliability of socio-technical systems and probabilistic safety assessments, the structural reliability and probabilistic models in mechanics, the reliability of equipment and the impact of maintenance on their behavior, human and organizational factors, and the impact of big data on reliability.

Finally, some R&D perspectives that can be developed in the future are presented.

Written by several engineers, statisticians and human and organizational factors specialists in the nuclear sector, this book is intended for all those who are faced with a reliability assessment of their installations or equipment: decision-makers, engineers, designers, operation or maintenance engineers, project managers, human and organizational factors specialists, experts and regulatory authority inspectors, teachers, researchers, and doctoral students.

ESReDA Honoray President
Jean-François Raffoux

The book can be ordered here.

Modeling Remaining Useful Life Dynamics in Reliability Engineering,
CRC Press, June 2023.
Pierre Dersin

This book applies traditional reliability engineering methods to prognostics and health management, and specifically Remaining Useful Life (RUL) dynamics.

In the context of the digital transformation, the last two decades have witnessed a significant evolution in the theory and practice of industrial maintenance : information and communication technologies now make it possible to replace traditional maintenance (i.e. scheduled preventive and corrective) with predictive maintenance, based on estimation and prediction of individual asset state of health.

Pierre Dersin

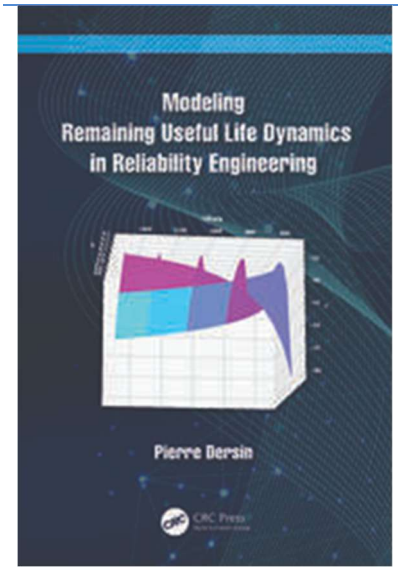
Consultant en System Safety, Reliability, and Maintenance Modelisation & Analysis

To that end, an invaluable decision support tool is the estimation of asset remaining useful life (RUL). RUL is a function of time ; it is also stochastic since it is affected by observation errors, variability of environmental conditions and mission profiles, and imperfect knowledge of degradation mechanisms .

Taking that uncertainty into account is essential for sound risk management . Failing to do so will generally lead to inappropriate maintenance decisions.

Methods used to estimate RUL are numerous and diverse and, broadly speaking, fall into three categories: model-based, data-driven, and hybrid. The author starts by building on established theory and looks at traditional reliability engineering methods through their relation to Prognostics & Health Management (PHM) requirements and presents the concept of RUL loss rate.

Following on from this, the author presents an innovative general method for defining a nonlinear transformation enabling the mean residual life (MRL) to become a linear



function of time, which leads to explicit analytical results, for instance for RUL confidence intervals and RUL probability distribution.

He applies this method to frequently encountered time-to-failure distributions, such as Weibull, gamma and lognormal, and first-hitting times of stochastic processes such as the Wiener or gamma process, used to model degradations .

Latest research results, including the author's (some of which were previously unpublished), are drawn upon and combined with very classical work. A complete chapter is devoted to the examination of the properties of the time transformation that allows for the linearization of the MRL. Statistical estimation techniques are then presented to estimate RUL from field data

Finally the use the results for maintenance support and in particular predictive maintenance, is discussed. A risk-based method for predictive maintenance optimization is presented.

The book ends with suggestions for future research, including links with machine learning.

Industrial applications are described and every chapter is followed by a series of exercises.

The book is of interest to engineers, researchers and students in reliability engineering, prognostics and health management, and maintenance management.

https://www.taylorfrancis.com/books/mono/10.1201/9781003250685/modeling-remaining-useful-life-dynamics-reliability-engineering-pierre-dersin

All ESReDA Members, 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