

# Exchange of Experts

June 3-6 2024

## Field report



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# 1 Objectives

Due to climate change, summers will get dryer, hotter, but also wetter. At the same time, energy transition and the built environment gets more sustainable, applying new materials and building constructions. Energy transition introduces new risks, like energy storage systems and hydrogen fed fuel cells in the streets and even in the domestic environment. Autonomous electricity grids are being built. These developments will bring fire safety issues with them, especially related to the changing urban environment due to energy transition (ET) and sustainable building (SB), for example green facades and roofs and wood as a construction material.

The NIPV strongly believes in sharing and collecting knowledge with international institutions, because a lot of practical knowledge is in the minds of experts. On some subjects we have practical experience as NIPV, but we are a small country that needs and likes to learn from others. Therefore, we gladly organize exchanges of experts. The subject of fire safety in relation with climate change, energy transition and sustainable building is very dynamic. These developments go very fast, and we notice that safety is not high on the political agenda. To keep up with the developments and assist in making the energy transition and sustainability (which is a European Priority) a safe transition, we need to follow developments strictly and share as much knowledge as possible within the EU and even from outside the EU.

We consider energy transition and sustainable building regarding fire safety a major research and knowledge sharing topic for the next years to come. Many aspects are still not known regarding safety of these developments. On the other hand, the number of institutes and experts that do practical research into this topic is limited. Therefore, we must update knowledge regularly, and although the subject is almost the same as last year, we consider the topic of big interest and necessary to update participants on the latest knowledge. All of this for the higher goal of keeping society safe during this big transition.

Experts (of fire safety and civil protection) were invited to discuss and exchange their knowledge of several topics that are current in these times. They were asked which subject they would like to contribute, which resulted in the following topics:

1. Fire safety aspects of timber structures and tall timber buildings
2. Sustainable construction materials (sandwich panels)
3. Safe Green Transition for the Fire and Rescue Services'
4. Fires in EVs and SOP's and BESS (Standard Operating Procedures)
5. Future Search new battery types and safety
6. Discussion about thermal runaway of Li-ion batteries
7. Wildfires and the risks for the wildland – urban interface
8. Hydrogen as a fuel: risks and solutions for tunnels and parking garages

The main objective of the Exchange of Experts in June 2024 at the Netherlands Institute Public Safety (NIPV) is to exchange developments and ideas regarding the fire safety

aspects of the above-mentioned developments in the participating countries. In 2023, we hosted a very successful and fruitful exchange regarding these topics already and this year we strive to take further steps into a collective approach on the complex safety issues that emerge.

We anticipate the following results:

1. We will learn the latest knowledge from foreign experts regarding the subject of fire safety regarding climate change, energy transition, and sustainable building.
2. Besides the professional development, we work on a solid network of experts who are working on the subject and keep on collaborating after and between physical exchanges.
3. Moreover, we collect the ideas about fire safety consequences and possible solutions to prevent and mitigate fires in the built environment with regard to these developments.
4. We aim to learn more about FSE simulation models, fire safety of building in wood as a material, and the growing energy transition. Nowadays, we see an increasing number of EV car fires in Europe, and specifically the EV car fires in underground parking lots are a challenge for the fire service. We intend to learn how to deal with these fires. Also, knowledge about Energy storage systems, their risks, and how to deal with fires is a major topic of interest.
5. Participants will gather knowledge from each other about the expected fire safety issues regarding ET and SB.
6. Participants will have exchanged the present ideas and knowledge in the participating countries about how to deal with these new fire safety risks.
7. Participants from member states will have an opportunity to network and create new alliances.
8. Member states can collaborate and have insight in each other's knowledge and ideas.
9. Member states can make proposals for more intense collaboration in the future.

The benefit is a mutual exchange of the developments in the participating countries as well as the collecting of the ideas about fire safety consequences and possible solutions to prevent and mitigate fires in the built environment with regard to these developments. The mentioned subjects are new all over Europe and there is no common holistic view yet.

The aim of this field report is to establish the insights gained during the exchange and the knowledge of fire safety issues related to the changing urban environment, like buildings that have green roofs and solar panels, and electrical driven cars that are parked in garages. Hopefully many other fire safety experts can benefit from this knowledge through the use of this field report.

The Exchange of Experts Programme is funded by the European Commission. CN-APELL RO, Romania, is the programme coordinator, being supported by its consortium partner - the General Inspectorate for Emergency Situation - IGSU, Romanian Ministry of Internal Affairs.

## 2 General program

The Exchange of Experts took place in Arnhem, the Netherlands and was organised by the NIPV. The program of the Exchange consisted of four days. From June 3<sup>rd</sup> till 6<sup>th</sup> 2024, experts came together at the NIPV. Following previous years, the Fire Safety Science (FSS) Congress was integrated in the program of the Exchange. In preparation of the Exchange, all experts were asked to provide specific input for the program based on their expertise. This resulted in an approval of the main topics proposed by the host: fire safety issues related to the changing urban environment and climate change, as well as several other topics like energy transition. All experts prepared a concise presentation on their field of work, their countries' developments, and challenges of the fire service. A detailed program of the Exchange is presented in chapter 6 and a list of participants can be found in chapter 5.

The description of the presentations in this report will be general. If more information is needed, please feel free to contact the host organisation NIPV or the particular participant.

*All participants of the Exchange of Experts on June 3<sup>rd</sup> 2024, including the Czech participant and the Dutch participants not within the program.*



*From left to right: Grunde Jomaas, Ondrej Vuchy, Ruud van Liempd, Marko Hassinen, Konrad Wilkins, Hanne Ketter, Lieuwe de Witte, Pim van Rede, Ricardo Weewer and Andrea Lucherini.*

# 3 Report

## 3.1 Monday June 3rd | Exchange of Experts

The general topic of this first day is sustainable building and fire safety engineering.

After arrival at NIPV, participants were welcomed by Ricardo Weewer, professor of Fire Service Science, and Lieuwe de Witte, professor of Fire Safety. Everyone shortly introduced themselves, the program was shared and coffee with cake was handed out. The experts then held individual presentations regarding their field of expertise.

Experts one by one shared a short presentation on their institutes' current knowledge, developments and challenges regarding fire safety issues.

### **Grunde Jomaas – Car park safety**

Grunde Jomaas is FRISSBE ERA Chair holder and head of the department for fire-safe sustainable built environment at the Slovenian National Building and Civil Engineering Institute (ZAG). Grunde presented his vision on car park safety within the frame of the dynamic changes in building and transport due to sustainability, climate change and energy transition. In his opinion fire safety research is essential to reach the goals regarding these topics. The existing knowledge about fire safety in car parks is not valid anymore, as the conditions, such as materials and size, have changed.



*Grunde Jomaas presenting car park fire safety*

Therefore, knowledge exchange and dissemination is key. Grunde showed some pictures and movies of recent car park fires to underline these observations and statements. The presentation is a plea for a better system to learn from real car park fires in specific and construction fires in general, for more interaction with society to manage expectations and for more collaboration between stakeholders. His conclusion was that at the EU level fire safety is the responsibility of many commissioners and therefore of nobody. Therefore, it would be advisable to start a commissioner of fire safety on EU level.

### **Lieuwe de Witte – Program of the professorate of fire safety**

Lieuwe de Witte is professor of Fire safety at NIPV. Lieuwe shares the general program of his research group. Within the frame of the dynamic environment, he frequently encounters the question “what is an acceptable risk?”. He shows some examples of fires that are acceptable according to the Building Act but, however, not explainable to the general public. So what *is* fire safety? Is it fire safe and explainable to the general public that a building is allowed to burn down completely, even if this is happening to domestic buildings? Lieuwe shows his vision on a new balance between prevention, protection, suppression and resilience of buildings and of citizens. It is therefore necessary to tell the “honest story”. Politicians should inform the public about what they can expect regarding fire safety. Lieuwe is now working on several studies on real fires that occurred in quickly built, refurbished sustainable houses and container unit buildings where the general conclusion is that the buildings met the regulations, but burnt down and the fire service was powerless.



*Lieuwe de Witte presenting*



## Ruud van Herpen – CLT fire behaviour experiments

Ruud van Herpen is fellow at Eindhoven University of Technology and fire safety advisor at Peutz. Ruud van Herpen showed a summary of radiation flux experiments by students in the Peutz Fire Lab on CLT samples (cross laminated timber). The experiments showed a direct relation between radiation flux and pyrolysis rate (burn-in speed) in the CLT samples. When the radiation flux is lower than 3 kW/m<sup>2</sup>, the pyrolysis rate will reduce to 0 after some time. Apparently, self-extinguishment of CLT only happens at low radiation fluxes, corresponding to gas temperatures lower than 250 degrees Celsius. Self-extinguishment has nothing to do with the depth of the char layer on the exposed surface. There is a strong belief that the thermal insulation of the char layer slows down the pyrolysis rate. This assumption is not correct, as the char layer is not an insulation layer in the thermal balance of the combustion process, but is the layer where the combustion takes place. The radiation flux is the only significant factor for self-extinguishment.

In practice, the results mean that exposed CLT in apartment buildings will always lead to a burn down scenario (without suppression). Protection by fire resistant cladding material or by a sprinkler installation is necessary.



*Ruud van Herpen presenting*

## **Andrea Lucherini - Emerging Hazards and Fire Safety Challenges in the Modern Sustainable Built Environment**

Andrea Lucherini is a senior researcher at Slovenian National Building and Civil Engineering Institute (ZAG) and fully supported by the FRISSBE project. Andrea presented the fire safety challenges regarding modern risks. He states that batteries are a new source of fire, a topic which is not being covered with the present standard testing methods like the room corner test. New test methods should be developed, which should be aimed at reduced flame spread and compartmentation. This requires a new fire safety strategy. The influence of these developments on modern fire scenarios should be considered. He argues that there are two ways of dealing with the problem. The first one is research, which takes a long time and solves the problems at the basis. Another way to deal with it is the practical engineering approach, which ensures fast solutions but without understanding the problem, for example the innovative ways of improving the fire resistance of wood. Remaining questions are: how can the fire service extinguish a wooden building, how can we check if the smothering fire is really out, and how does the building react on the application of a lot of water by the fire service?



*Andrea Lucherini presenting*

## **Ruud van Liempd – competency in the fire sector**

Ruud van Liempd is a researcher at the NIPV. Ruud presents a few statements to a discussion with participants on the competences needed to transgress from a rule-based fire safety system to a performance-based fire safety system. He shows a few examples of new fire causes and new fire development. His presentation was meant to start a discussion between participants about this issue. It seems to become a crucial topic within the fire service.



*Ruud van Liempd presenting*

### **Konrad Wilkens Flecknoe- Brown – Fire protection of wooden buildings in Sweden**

Konrad is a researcher at Lund University in Sweden with a broad background in fire safety. At the moment he is working on a study on fire resistance of wood and the effect of aging on the wood and the fire retardants used. Konrad shares the goals and the methodology of his studies, and already some of the results.

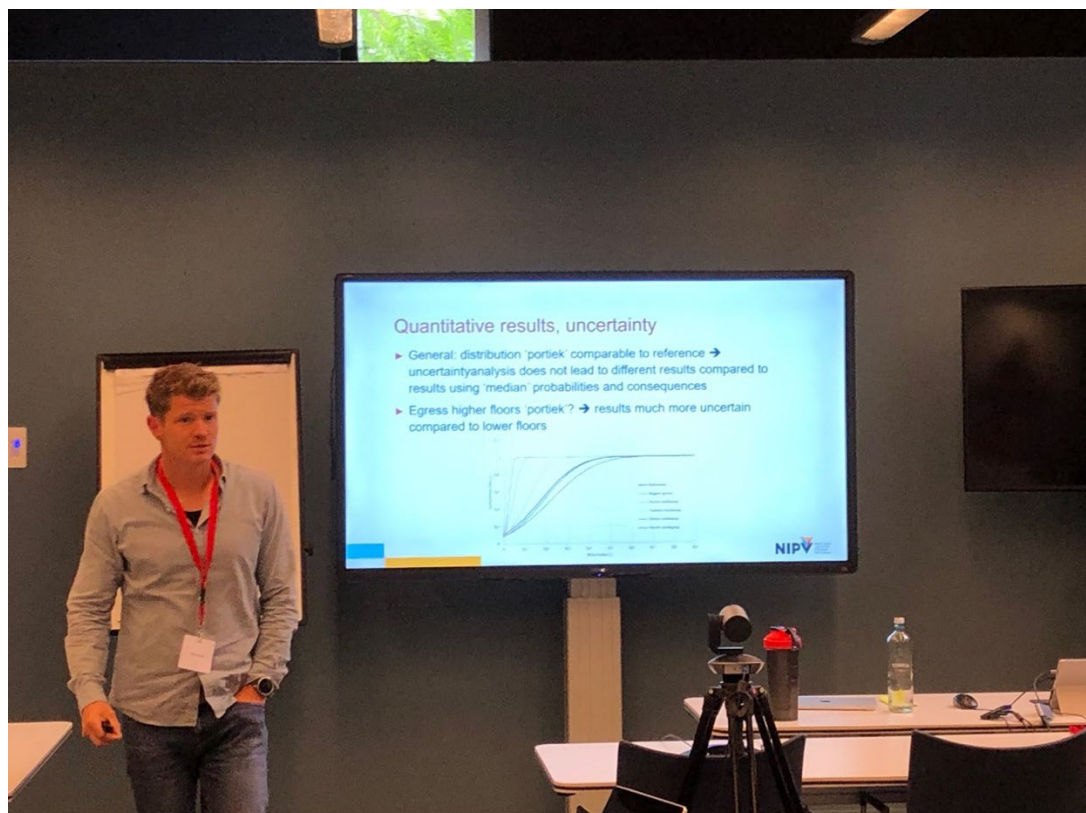


*Konrad Wilkens presenting*

In Sweden, apparently wood is being treated to improve the fire resistance with various chemical substances. The study deals with the question for how long will this fire resistance be in order. Therefore, all kinds of wood samples are being studied with non-destructive methods like scanning electron microscopy and calorimetry Raman, FTIR. Studying aging of wood fire resistance was not possible earlier.

### **Pim van Rede – Fire safety of apartment buildings with single escape routes**

Pim van Rede is a researcher at the NIPV specialized in Fire Safety Engineering. Pim presented the results of his risk-analyses of three kinds of residential-type buildings in the Netherlands which have one escape route. According to the Dutch Building Code, this is allowed. Within the frame of new knowledge about smoke propagation in apartment buildings, and a fire in such a building where a father and a child died, studies were done on this topic. Pim applied two methods to assess the risks and formulate solutions of these three types of buildings. A quantitative way (QRA) and a qualitative way (with an expert judgment group). A variety of solutions is possible depending on the situation.



*Pim van Rede presenting*

## 3.2 Tuesday June 4<sup>th</sup> | Exchange of Experts

This second day, the focus of the exchange was on the topic of energy transition, lithium ion battery fires, and firefighting procedures

### Expert presentations

#### Henk Brans - Future Search new battery types and safety

Henk Brans is a researcher at the NIPV specialized in energy transition and its possibilities and issues. Henk did a short introduction into his findings and explanation on thermal runaways. Henk carried out a literature study into new kind of batteries for the future in order to assess whether they would be safer. Lithium ion batteries with solid electrolytes, or sodium-based anodes or even anodes made of pure lithium are being worked on at the moment, His conclusion was that they are probably a little safer than NMC or LFP, but thermal runaway still cannot be excluded.



*Henk Brans presenting*

### **Brian Verhoeven – Wildfires in Northern Europe**

Brian is a researcher at the NIPV specialized in wildfires. He is also a meteorologist. The weather conditions are, amongst others, a very important factor in how wildfires develop. Brian predicts that wildfires in the future may get uncontrollable easier than they used to. Brian is also involved in a European project, EWED. In EWED, a new phenomenon is studied: ferocious convective fires which may develop due to rising of hot air forming a pyrocumulus cloud. Until now, it was unpredictable if and how this could develop, so fire service was overwhelmed. The research of EWED intends to find the parameters to predict convective fires.



*Brian Verhoeven presenting*

### **Hanne Riis Ketler - Safe Green Transition for the Fire and Rescue Services**

Hanne works for of the Danish Emergency Management Agency (DEMA). She and colleagues at DEMA Emergency Services College write practical and procedures for firefighters, at the moment focusing on safe procedures for incidents with batteries, electrical vehicles and Battery Storage Systems (BESS). After a short introduction on the organisation of DEMA, she explains that her challenge is to reduce new risks to standards firefighters already know, so that it does not look like there is something completely new to absorb. She presents a generic procedure to approach incidents with BESS and how Incident Commanders are trained in a scenario-based approach which is now being adjusted with new terms to maintain safety for firefighters in the green transition. The procedures are translated into English for sharing knowledge.



Hanne Riis Ketler presenting

### **Margreet Spoelstra - Risks of Hydrogen in parking garages**

Margreet Spoelstra is a researcher at the NIPV and she specializes in the risks and solution of hydrogen as a fuel. She presents the results of her study into the phenomena occurring when an hydrogen tank in a vehicle fails in an underground parking garage. Explosion of the tank and a torch fire when the escaping hydrogen is ignited do not give more problems than normal cars. However, a gas cloud explosion may have effect on the structure of the parking garage. Her study was aimed at structural failure of the garage construction and not at the life safety of possible people present in the garage.



*Margreet Spoelstra presenting*

### **Marko Hassinen – BESS firefighting considerations**

Marko is a university lecturer at University of Eastern Finland, but also a volunteer firefighter and worked previously as a senior research scientist at the Emergency Service Academy Finland. He also runs a startup company, Fire and Rescue Innovation Finland. His presentation was about fighting BESS fires from a firefighter point of view. He presented the results of experiments with BESS lithium-ion battery stacks. In Finland, there is a recommendation that the BESS container is equipped with explosion pressure relief as described by EN 14491 standard and that the spots for exterior cooling should be marked on the container. Therefore, it is possible to apply a piercing tool from outside for cooling the batteries with the goal of limiting the thermal runaway propagation to module level.





*Marko Hassinen presenting*

### **Ondrej Suchy - Lithium Batteries Under Fire Conditions (Parking Garage Fire with Use of Cobra Coldcutter)**

Ondrej Suchy is the head of the Technical Institute of Fire Protection (TIFP), that is a part of the Directorate General of Fire Rescue Service of the Czech Republic. National fire service Research Department in the Czech Republic. He presented a short introduction of his organization. The institute has four main tasks: fire testing of equipment for the fire service as well as its subsequent certification, research and development, such as large-scale tests, fire engineering simulations with FDS, and a laboratory for fire investigation. Additionally, a task is carrying out fire investigation in specialized situations. At the moment, the research department is studying the application of cold cutting systems to terminate thermal runaway in electrical vehicles. As an example, he presents the lessons of a fire in an electrical vehicle in an underground car park in Prague, where firefighters for the first time applied the cold cutter to terminate the thermal runaway. There were important lessons, and this was the reason for starting the study.



*Ondrej Suchy presenting*

After a full day of presentations and exchanging knowledge, there was still some time to discuss further topics with some refreshments and a snack. The hosts and participants looked back on the exchange itself and concluded that the first two days were already productive and fruitful.

### 3.3 Wednesday June 5<sup>th</sup> | Plenary presentations

On Wednesday the 5<sup>th</sup> and Thursday the 6<sup>th</sup> of June the program was integrated with the Fire Safety Science (FSS) Congress, held at the NIPV in Arnhem, the Netherlands. The following descriptions contain all plenary presentations during those days, as well as the given workshops in the afternoons. Some of the (interactive) workshops were only available in Dutch, but participants could choose in advance which workshop they wanted to attend. About 190 participants from various countries attended the congress. Professor Lieuwe de Witte welcomed everybody and set the goals and themes of this event.



*Welcome to all participants by Lieuwe de Witte.*

After the introductory speech Lieuwe passed the word to the chair of the congress, Jolanda Trijselaar, de director of the Safety Region Midden-West Brabant and Chief Fire Officer of the Regional Fire and Rescue Service.

In her opening speech Jolanda stressed the importance of this congress and sharing knowledge about the fire safety in regard to the challenges of sustainability and climate adaptation. She introduced the program and wished everybody an interesting congress.



*Opening of the Fire Safety and Science congress by the chairwoman Jolanda Trijselaar*

### **3.3.1 PV Fire Safety on Roofs: a Guideline for Reduced Consequences**

Grunde Jomaas presents the newly release Fire Safety Guideline for PV Systems on Flat Roofs. It can be downloaded here: <https://www.frissbe.eu/news/publication-of-building-applied-photovoltaics-bapv-fire-safety-guideline>.



*Grunde Jomaas during his keynote lecture*

Due to time pressure introduced by the fast implementation plan for PV systems on roofs, these are of particular interest. Therefore, in order to ensure a safe and just implementation of PV systems on roofs, the fire risk that they introduce must be sufficiently assessed. In addition, all stakeholders should have a clear guidance on how to reduce the risk

### 3.3.2 Fire Safety as the Key to Sustainable and Rapidly Built Housing: The Common Thread from Fires in the Building Envelope

Margrethe Kobes is a senior researcher at the NIPV. She presents the lessons from a study into three fires that occurred recently in the Netherlands. The fires started inside the building and developed very fast towards the roof and from the roof over the building. Typically, these were examples of a building on fire instead of a fire in the building. The conclusion was that the buildings all met the requirements of the Building Act, but nevertheless a large number of apartments was destroyed by the fire. Fortunately, nobody got hurt. The conclusion was that fires that can get into the building envelope are new and the requirements in the Building Act do not take into account this possibility because they are based on stony materials. The fire service is not prepared for this kind of fire behaviour and does not have equipment and manpower to fight the fire effectively. A societal discussion on what the level of fire safety should be is advised.



*Margrethe Kobes presenting*

### 3.3.3 Lessons from a fire in the Sheraton Hotel in Brussels

Christian Gryspeert is Deputy Chief Fire Officer in Belgium and also connected to Ghent University as a scientist and fire safety engineer. He is involved in the learning commission of Ghent University. Christian presents the evaluation and the lessons from a fire in Brussels, where a firefighter lost his life when an escalator collapsed. The fire started in a

large highrise building under renovation. The study consisted of interviews with firefighters and simulations of the fire development. It turned out that the escalator could collapse due to the rare circumstances that it was heated from above and expanded. Due to the expansion the escalator buckled and fell from its support. The fire had, understandably, a very big impact on the firefighters.



*Christian Gryspeert presenting*

## 3.4 Wednesday June 5<sup>th</sup> | Workshops

### 3.4.1 The fire and decay in cooling phase of post-flashover compartment fires

Andrea Lucherini, senior researcher at ZAG, Slovenia, presented his findings from a research study on the fire decay and cooling phase of post flashover fires. Recent research has highlighted the relevance of adopting holistic performance-based methodologies for the design of fire-safe buildings. These approaches aim at ensuring the stability and integrity of construction elements until complete fuel burnout and cooling. The workshop discussed the traditional compartment fire framework and highlighted its shortcomings. The workshop focussed particularly on the main characteristics of the fire decay and the cooling phase of post-flashover fires. Also, the relevance and challenges for the main construction materials such as concrete, steel and wood were discussed and compared.



*Andrea Lucherini leading a workshop*

### 3.4.2 Performance based design: why we need a different approach in fire safety in the Netherlands

Ruud van Liempd is a researcher at the NIPV. The built environment is changing fast, with new building materials, building methods and new risks, e.g. risks related to energy transition. These changes influence the fire safety of the built environment. The current Dutch building code is a rule-based building code. This rule-based building code relies on experience of the way we build buildings and the risks that exist. His workshop looked at shortcomings of the current Dutch building code regarding tackling these changes. also It also looked into performance-based fire safety as a solution to create fire safety in a fast changing built environment.



*Ruud van Liempd leading a workshop*

### **3.4.3 Major fire in The Hague, application of defensive external attack to stop fire spread**

Lars de Niet is fire officer and on-scene commander in The Hague Fire and Rescue Service. He shares his experiences and the lessons learnt from a major fire in an old apartment block in The Hague. The fire spread very quickly across the block and the fire service had to think of a plan to stop the fire from spreading to some apartments away from the fire. In the Netherlands the defensive approach is being developed. The fire service of The Hague also installed a specialist fire station with special equipment like unmanned vehicle, ventilators, cold cutter and fog nails. In this case, a combination of fog nails and a hole in the roof stopped the fire.





Lars de Niet leading a workshop

### 3.5 Thursday June 6th | Plenary presentations

In the morning, two presentations were given: the first one by Rory Hadden, researcher at Edinburgh University, and the second one by Jason Tai and James West from the Bedfordshire Fire and Rescue Service. In the afternoon, there were workshops.

#### 3.5.1 Fire and Mass Timber

Rory Hadden presented his ideas on building in wood. He states that there are a lot of myths regarding fire safety and that often new developments are being considered as bad. It is a matter of belief he says. If you believe in something, you can solve the problems, as is the case with building in wood. He presented a clear overview of the current gaps in knowledge when it comes to the fire safety of timber-structures and concluded his talk with an important question. Are we able to codify the fire safety of mass timber buildings given the aforementioned gaps?



Rory Hadden in his presentation

### 3.5.2 Fire in the Luton airport car park

Jason Tai and James West from the Bedfordshire FRS present the results of their investigation into the cause, development and suppression of the major fire in the Luton Airport car park. The report is to be published, and therefore it was a sneak preview. The fire at Luton Airport was the third major car park fire (as far as we know) in Europe over the past few years and there is a lot to be learned by fire engineers.



Jason Tai presenting

## 3.6 Thursday June 6<sup>th</sup> | Workshops

### 3.6.1 Radiation calculations of an electrical vehicle on fire

In a workshop, Henk Brans presents his calculations of the heat radiation from an electrical vehicle on fire. This topic is of interest regarding the probability of fire spread in a parking garage between two electrical cars. The question is whether fire in an electrical car will cause a faster fire spread to other cars in the garage. Although there are differences in fire behaviour, e.g. a torch fire from the battery pack and a possible gas cloud explosion, Henk concludes that in general the majority of the radiation will be caused by the car itself, and therefore there will not be much difference between an electrical vehicle and a car on fossil fuels.



*Henk Brans leading a workshop*

### 3.6.2 Fire resilient buildings after the energy transition

Ruud van Herpen, TU Eindhoven presents. Fire resilience is not an objective of Building Codes. It is acceptable that biobased buildings are less fire resilient than traditional buildings. What are the consequences? And what are facts and what is fiction? Does the char layer on a timber construction reduce the burn-in speed? Does biobased insulation material reduce the fire spread in a facade?

# 4 Conclusions

## 4.1 Evaluation of objectives

As the host of the Exchange of Experts, we are proud to say that the results that were anticipated before the start of the exchange are achieved. Although this is the second time we organised an exchange and congress on the topic of sustainable building and energy transition, it is still actual and necessary to share the latest knowledge. The developments in society as well as knowledge development and insights regarding this topic are at high speed. There is not much opportunity to discuss this topic in depth with colleague scientists and practitioners. We expect that in the next coming years this will remain of importance. For this event, participants have been able to exchange the most recent practical knowledge about energy transition and sustainable building developments in the participating countries. They have gathered knowledge from each other about the expected fire safety issues regarding ET and SB and the present ideas about how to deal with these new fire safety risks. New alliances have been formed and the opportunity to network has been successfully taken by the participants. This has been the start of new proposals for collaboration in experiments or future research.

## 4.2 General conclusions

From the presentations on sustainable building, energy transition, in specific lithium ion batteries, it was concluded that the technological developments to slow down and mitigate climate change are going really fast. Safety is not regarded enough in the developments. Knowledge development and First Responder Response techniques can hardly keep up with these developments. Risks are generally still unknown.

## 4.3 Other conclusions and takeaways

- To address future (unknown) risks, it is key to involve society and politicians. Fire safety is not high on the agenda yet. There is an urge to readdress the acceptable level of fire safety in society. Politicians should take their responsibility, because civilians hardly understand that buildings are allowed to burn down entirely according to existing building codes.
- The severity of parking garage fires in open parking garages is becoming more and more clear, even if electrical vehicles are not the cause of the fire. The regulations regarding the “openness” of the car parks and their building construction strength should be readdressed.
- There are a lot of initiatives in the EU to study the effects of sustainable building and battery safety as well as knowledge development, risk assessments, and operational

procedures. During this exchange, we were able to exchange existing knowledge and learn from each other. We created a network that remains to exist in the future.

- Future wildfires in the northern part of Europe may be of the same order as already known for many years in southern Europe. Especially convective fires are a new phenomenon and this has to be studied further in order to predict how fires can develop and how they can be extinguished in a safe way.
- Fire safety engineering as a profession is getting less and less popular, while at the same time, more professionals are needed to address future unknown risks. FSE has a marketing problem, so more promotion is needed.
- There is a lot of effort and urge in building with wood as a construction material. However, the risks are still not well-known, and the testing procedures as well as the simulation models are not fit to work for wood. This is a serious problem to address by fire safety engineers all over the EU, and also a big issue to be concerned about, as politicians do not have the right picture and a lot of knowledge is lacking. More research needs to be done in the EU. Theory and practice must be connected, but remember this is still a major safety risk.
- The fire service of the future is likely not able to respond in the way that we are used to anymore. Innovation is key, and data science, real time intelligence and business intelligence, making more use of existing data (which are at the moment not available for the FRS) are needed to create better, safer and more effective operational procedures for the FRS.
- The response to battery fires is still a big issue, especially for BESS systems. Gradually, the knowledge about the process of thermal runaway is clear. However, it still poses a problem to get the water inside the battery pack. The FRS in the member states are experimenting with cutting systems and other ways to put water inside. The results of these experiments need to be shared regularly to keep up with developments.
- The fire safety of battery packs should in fact be solved by manufacturing intrinsically safe battery packs. The future developments e.g. solid state batteries and sodium ion batteries do not seem to be the solution. Industry should take more effort in this, instead of putting the FRS in the position of solving the problem when it goes wrong.

## 5 List of participants

Participants Exchange of Experts	Country/Alliance
Konrad Wilkens	Sweden
Andrea Lucherini	Slovenia
Grunde Jomaas	Slovenia
Hanne Riis Ketler	Denmark
Ruud van Herpen	The Netherlands
Marko Hassinen	Finland
Roy Weghorst	The Netherlands
Henk Brans	The Netherlands / NIPV
Lieuwe de Witte (host)	The Netherlands / NIPV
Ricardo Weewer (host)	The Netherlands / NIPV
Pim van Rede	The Netherlands / NIPV
Ondrej Suchy	Czech Republic
Brian Verhoeven	The Netherlands / NIPV
Ruud van Liempd	The Netherlands / NIPV
Margreet Spoelstra	The Netherlands / NIPV
Online: Oleksandr Lazarenko	Lviv State University of Life safety, Ukraine (online)

# 6 Program

## Program June 3rd 2024

<b>08.30</b>	Pick-up from hotel to NIPV
<b>09.00 - 09.15</b>	Welcome and introduction
<b>09.15 - 10.00</b>	Presentation Grunde Jomaas: Car Park Fire Safety
<b>10.00 - 10.30</b>	Presentation Lieuwe de Witte (NIPV): Program of the professorate of fire safety
<b>10.30 - 10.45</b>	Coffee break
<b>10.45 - 11.30</b>	Presentation Ruud van Herpen (TUE): CLT fire behaviour experiments
<b>11.30 - 12.00</b>	Discussion about previous presentations
<b>12.00 - 12.30</b>	Lunch
<b>12.30 - 13.15</b>	Presentation Andrea Lucherini: Fire safety aspects of timber structures and tall timber buildings
<b>13.15 - 14.00</b>	Presentation Ruud van Liempd (NIPV): Competency in the fire sector
<b>14.00 - 14.30</b>	Discussion sustainable building and FSE
<b>14.30 - 15.00</b>	Break
<b>15.00 - 15.45</b>	Presentation Konrad Wilkens (Lund) Fire protection of wooden buildings in Sweden
<b>15.45 - 16.30</b>	Presentation Pim van Rede (NIPV): Fire safety of apartment buildings with single escape routes
<b>16.30 - 17.00</b>	Discussion about previous presentations
<b>17.00 - 17.30</b>	Wrap-up
<b>17.30 - 18.00</b>	Pick-up from NIPV to hotel
<b>18.30</b>	Dinner at Bastionhotel

## Program June 4th 2024

<b>09.00</b>	Pick-up from hotel to NIPV
<b>09.30 - 10.00</b>	Presentation Henk Brans: Future Search new battery types and safety
<b>10.00 - 10.30</b>	Presentation Henk Brans: Electrical vehicle fires (NIPV)
<b>10.30 - 11.00</b>	Coffee break
<b>11.00 - 11.30</b>	Discussion
<b>11.30 - 12.15</b>	Presentation Hanne Riis Ketler Safe: Green Transition for the Fire and Rescue Services
<b>12.15 - 13.00</b>	Lunch
<b>13.00 - 13.45</b>	Presentation Brian Verhoeven: Wildfires in Northern Europe
<b>13.45 - 14.30</b>	Presentation Marko Hassinen : BESS firefighting conditions
<b>14.30 - 15.00</b>	Presentation Margreet Spoelstra: Risks of Hydrogen in parking garages
<b>15.00 - 15.15</b>	Snacks and drinks
<b>15.15 - 16.00</b>	Presentation Ondra Suchy: Fire in a car park in Prague
<b>16.00 - 16.30</b>	Presentation Ricardo Weewer on Future Search & innovation(NIPV)
<b>16.30 - 17.00</b>	Discussion and wrap-up by Ricardo Weewer
<b>17.00 - 17.30</b>	Pick-up from NIPV to hotel
<b>19.00</b>	Dinner at Rung



## Program June 5th 2024

	Onderwerp	Speaker
09.00 - 09.30	Pick-up from hotel to NIPV	
09.30 - 10.00	Welcome	
10.00 - 10.10	Introduction	Lieuwe de Witte
10.10 - 10.20	Opening chairwomen	Jolanda Trijselaar
10.20 - 11.05	PV Fire Safety on Roofs - a Guideline for Reduced Consequences	Grunde Jomaas
11.05 - 11.30	Coffee break	
11.30 - 12.15	Fires in the building envelop	Margrethe Kobes
12.15 - 13.00	Fire Sheraton Hotel Brussel	Christian Gryspeert
13.00 - 13.45	Lunch	
13.45 - 15.00	Performance based design: why we need a different approach in fire safety in the Netherlands	Ruud van Liempd
15.00 - 15.30	Coffee break	
15.30 - 16.45	The fire decay and cooling phase of post-flashover compartment fires	Andrea Lucherini
16.45 – 20.00	Networking and BBQ at NIPV	
20.00 - 20.30	Pick-up from NIPV to hotel	

## Program June 6th 2024

	Onderwerp	Speaker
<b>09.00 - 09.30</b>	Pick-up from hotel to NIPV	
<b>09.30 - 10.00</b>	Welcome and introduction	
<b>10.00 - 10.05</b>	Opening chairperson	Jolanda Trijselaar
<b>10.05 - 11.05</b>	First and Mass Timber	Rory Hadden
<b>11.05 - 11.30</b>	Coffee break	
<b>11.30 - 12.15</b>	Learning from the fire in a parking lot at Luton Airport	Jason Tai and James West
<b>12.15 - 13.00</b>	Presentation students on Fire Safety and Engineering	Ricardo Weewer and David den Boer
<b>13.00 - 13.45</b>	Lunch	
<b>13.45 - 15.00</b>	Safety distances around car fires	Henk Brans
<b>15.00 - 15.30</b>	Coffee break	
<b>15.30 - 16.45</b>	Fire resilient buildings after energy transition	Ruud van Herpen
<b>16.45 - 17.30</b>	Networking	
<b>17.30 - 18.00</b>	Pick-up from NIPV to hotel	