The energy transition

The importance of continuous knowledge updates for emergency responders

The rapid evolution of the energy sector, marked by the shift toward hydrogen, ammonia, and lithium-ion battery technologies, demands constant updates in the knowledge and training of emergency personnel. Once only seen in industrial applications, now these hazardous materials will be more embedded in the public domain. As these energy technologies present unique challenges and hazards, keeping responders informed and prepared is essential to ensure safety, operational efficiency, and environmental protection. This article outlines the significance of updating emergency responder knowledge and skills to effectively manage the risks associated with new energy technologies.

The energy transition and emerging technologies

The global shift from fossil fuels to renewable and alternative energy sources introduces new risks and hazards for emergency responders. Key technologies driving this transition include:

- **Hydrogen:** Often considered a future fuel for transport and industry, hydrogen is highly flammable and presents explosion risks under certain conditions. Handling hydrogen requires specialised knowledge of its properties and containment requirements whether that's pressurised to 750 bar or cooled to a liquid at -253°C.
- **Ammonia:** Traditionally used in agriculture, ammonia is gaining traction as a zero-carbon fuel alternative. While it burns without emitting CO_2, ammonia is toxic and corrosive, requiring strict handling protocols to mitigate health and environmental risks.
- **Lithium-Ion Batteries:** Used extensively in electric vehicles (EVs) and renewable energy storage, lithium-ion batteries present unique fire hazards. Battery fires are difficult to extinguish and can result in toxic smoke and thermal runaway incidents, necessitating specialised response strategies.

These technologies, while promising for a sustainable future, require specific handling skills and hazard mitigation approaches due to their complex and often hazardous properties.

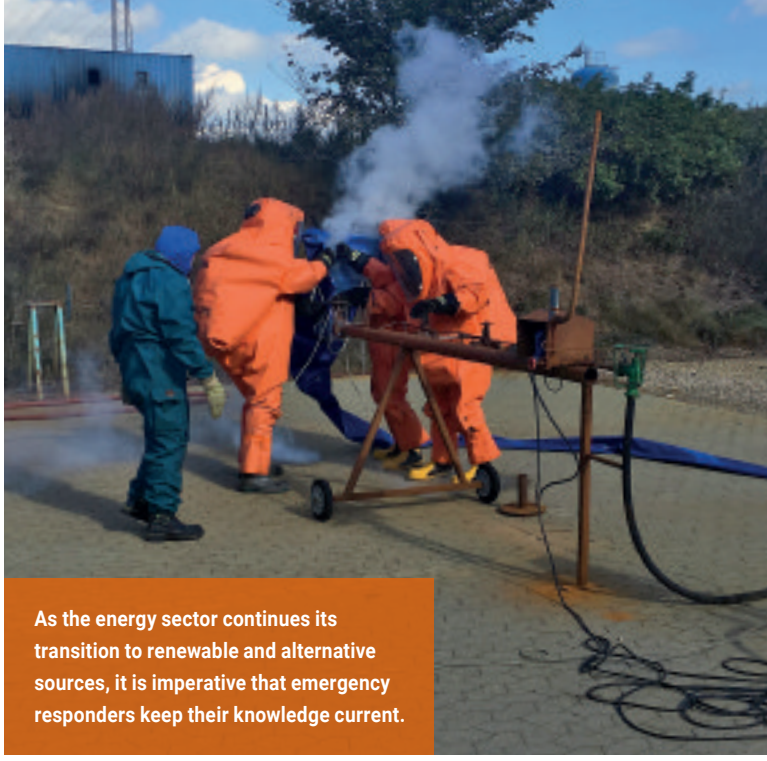
Why knowledge updates are essential for emergency responders

Improved safety and incident management

Keeping emergency personnel informed about the latest developments in energy technologies enhances their ability to respond to incidents safely and effectively. Each new technology introduces different risks that must be managed correctly:

- **Hydrogen:** Requires responders to have knowledge and understanding of the physical properties unique to this fuel, such as high flammability and very low minimum ignition energy (MIE); even minute static discharges can initiate ignition, invisible flames and detonation risks in confined spaces, detection

Here we see ammonia training RelyOn Esbjerg. The global shift from fossil fuels to renewable and alternative energy sources introduces new risks and hazards for emergency responders.



As the energy sector continues its transition to renewable and alternative sources, it is imperative that emergency responders keep their knowledge current.

challenges and high possibilities of leakages due to small molecular size and storage at very high pressures or extreme cryogenic temperatures. All offer specific challenges to a safe response where the right strategy, tactical approach and skills at the operational level.

- **Ammonia:** To successfully manage an incident involving ammonia, like other hazardous substance's an in-depth understanding of its properties is necessary, such as high toxicity giving severe respiratory distress, irritant effects to eye's nose and throat even at low concentrations, corrosive properties and chemical burns. Furthermore ammonia has an exothermic reaction to water, is flammable under certain conditions and offers significant risk to aquatic life due to runoff from ammonia incidents. However, the most problematic is how ammonia gas release can affect the surroundings and the dispersion of that migrating gas cloud. Ammonia incidents require responders to be prepared for unique and severe hazards, from toxic vapour exposure to corrosive and potentially explosive reactions. Thorough training and proper use of equipment is critical in ensuring responder safety and minimising the environmental and health impacts of ammonia incidents.
- **Lithium-Ion Batteries:** Responders need to be aware of specific hazards, like thermal runaway and hydrofluoric acid gas releases which can rapidly escalate, particularly in unclosed areas, such as underground car parks.

‘Regular updates on the properties, risks, and handling techniques for technologies like hydrogen, ammonia, and lithium-ion batteries are essential to ensure responder safety’

Electric vehicles create a significant challenge to responders, as the batteries are so well protected from the elements that it’s impossible to apply any extinguishing agents or cooling to control the fire. An EV car fire will escalate rapidly to other vehicles in the vicinity.

Updated training equips responders with the knowledge to recognise these unique risks and take appropriate action, which reduces the likelihood of injury and loss of life during emergencies.

Adaptation to changing energy infrastructure

The infrastructure supporting the deployment of hydrogen, ammonia, and lithium-ion technologies is rapidly expanding, with hydrogen refuelling stations, ammonia fuel depots, and lithium-ion battery storage facilities becoming more prevalent. This infrastructure development increases the likelihood of emergency situations involving these technologies.

How can we train for this?

A mixture of theoretical teaching (face-to-face or online) supported by practical demonstrations showing the characteristics of each material and finally creating simulations that can mimic the response goals to give that real-life awareness of the risks to responders and to ensure that the incident can be done in a safe and efficient manner. This blended learning approach will fully grasp the needs of each sector.

Environmental protection and risk mitigation

Incidents involving hydrogen, ammonia, or lithium-ion batteries can have significant environmental impacts if not managed correctly. For instance, ammonia spills can contaminate water sources, and battery fires can release toxic chemicals into the air and water. Updated training ensures that responders can take appropriate containment actions, minimising the environmental footprint of an incident.

Furthermore, with climate-related risks on the rise, it’s essential for responders to have current knowledge on containment methods that align with environmental regulations and sustainability standards. Informed responders are better equipped to prevent environmental contamination and mitigate the broader impacts of energy technology incidents.

Regulatory compliance and public confidence

Governments and regulatory bodies worldwide are starting to set stringent safety standards for new energy technologies. Emergency response agencies must stay compliant with these evolving regulations, which often mandate specific training and knowledge in handling new energy hazards.

Compliance with these standards not only avoids legal repercussions but also builds public trust. Communities are more likely to support the development of hydrogen, ammonia, and battery facilities if they have confidence in the preparedness of emergency responders.

Recommendations for implementing knowledge updates

To maintain preparedness in the face of evolving energy technologies, it is recommended that emergency response agencies adopt the following measures:

1. **Continuous Professional Development:** Establish programmes that provide regular updates on the properties, risks, and mitigation strategies for new energy technologies.
2. **Simulations and Drills:** Integrate realistic scenario-based drills for hydrogen, ammonia, and lithium-ion battery incidents to help responders develop practical experience in managing these hazards.
3. **Collaboration with Industry Experts:** Partnering with energy companies and technology providers can give responders access to the latest information and technical insights on emerging energy systems.
4. **Adoption of Digital Tools:** Utilise digital platforms for real-time information sharing and virtual training on new safety protocols, containment measures, and environmental protection strategies.

Conclusion

As the energy sector continues its transition to renewable and alternative sources, it is imperative that emergency responders keep their knowledge current. Regular updates on the properties, risks, and handling techniques for technologies like hydrogen, ammonia, and lithium-ion batteries are essential to ensure responder safety, regulatory compliance, environmental protection, and community confidence. By investing in continuous learning, response agencies can ensure they are fully prepared to manage the challenges posed by the future of energy.

Any further queries regarding specific training in these areas please contact our customer services department on fireacademy.nl@relyonnutec.com

For more information, go to fire.relyonnutec.com

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Stephen is a former UK Fire Officer in the West Midlands Fire Service, experienced in operations, recruit probationary training and specialist fire safety. He joined Rotterdam International Safety Centre (RISC) in 1999, firstly as a senior instructor delivering command training for the oil and gas sectors, firefighter training for shipping and offshore and since those early days has subsequently provided consulting services on training and response competencies for the high risk industries, emergency response pre-planning, training centre design and crisis management in Europe and the Middle East. He played a role in the response planning for small scale LNG incidents in the Rotterdam harbour. In 2018 he designed and opened the new third-generation training facility in Rotterdam (RelyOnNutec Fire Academy, formerly Falck Fire Academy and RISC) to meet the future emergency response training challenges and testing for the foam and energy transitions.

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