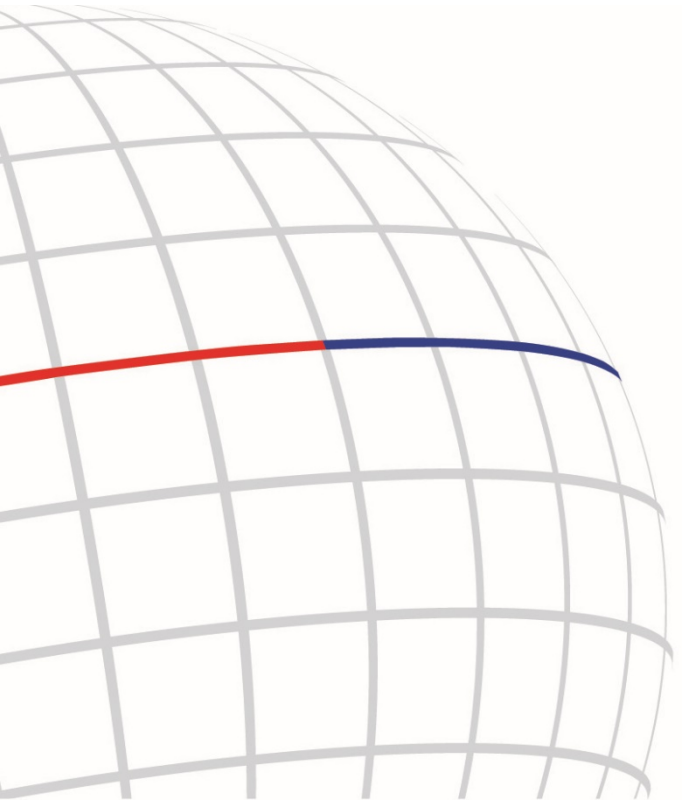
Water-based fire suppression as an enabler for NetZero

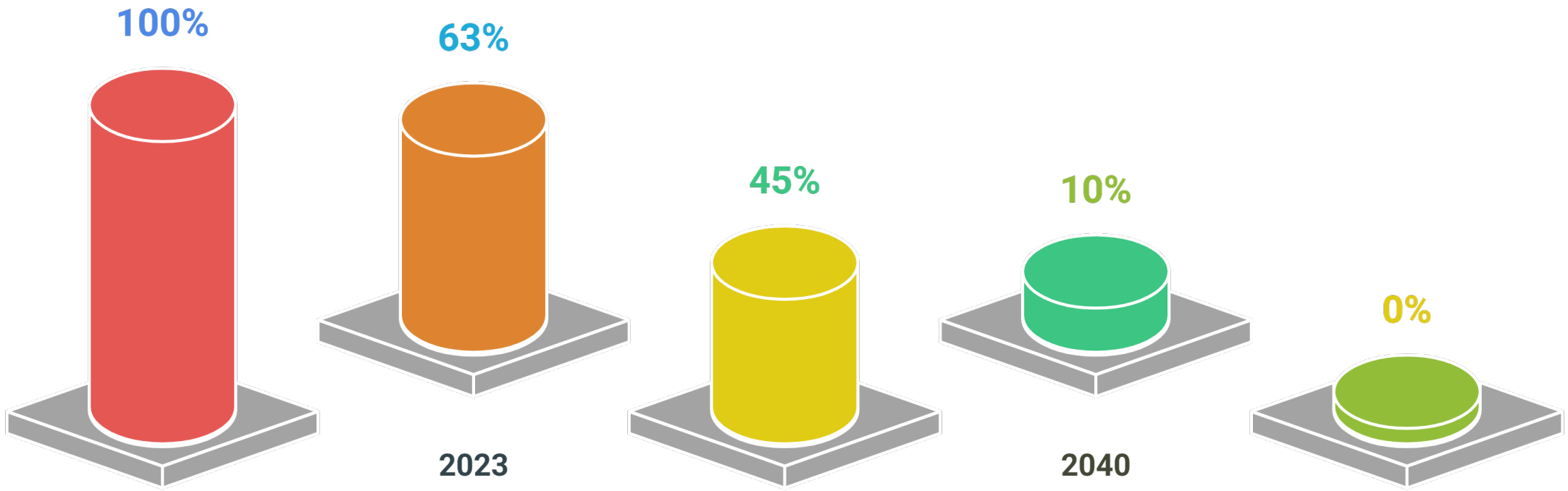


Chris Gill, 7 May 2025

Fire Protection.

Reacting to growing environmental demands

European Commission climate strategy & targets



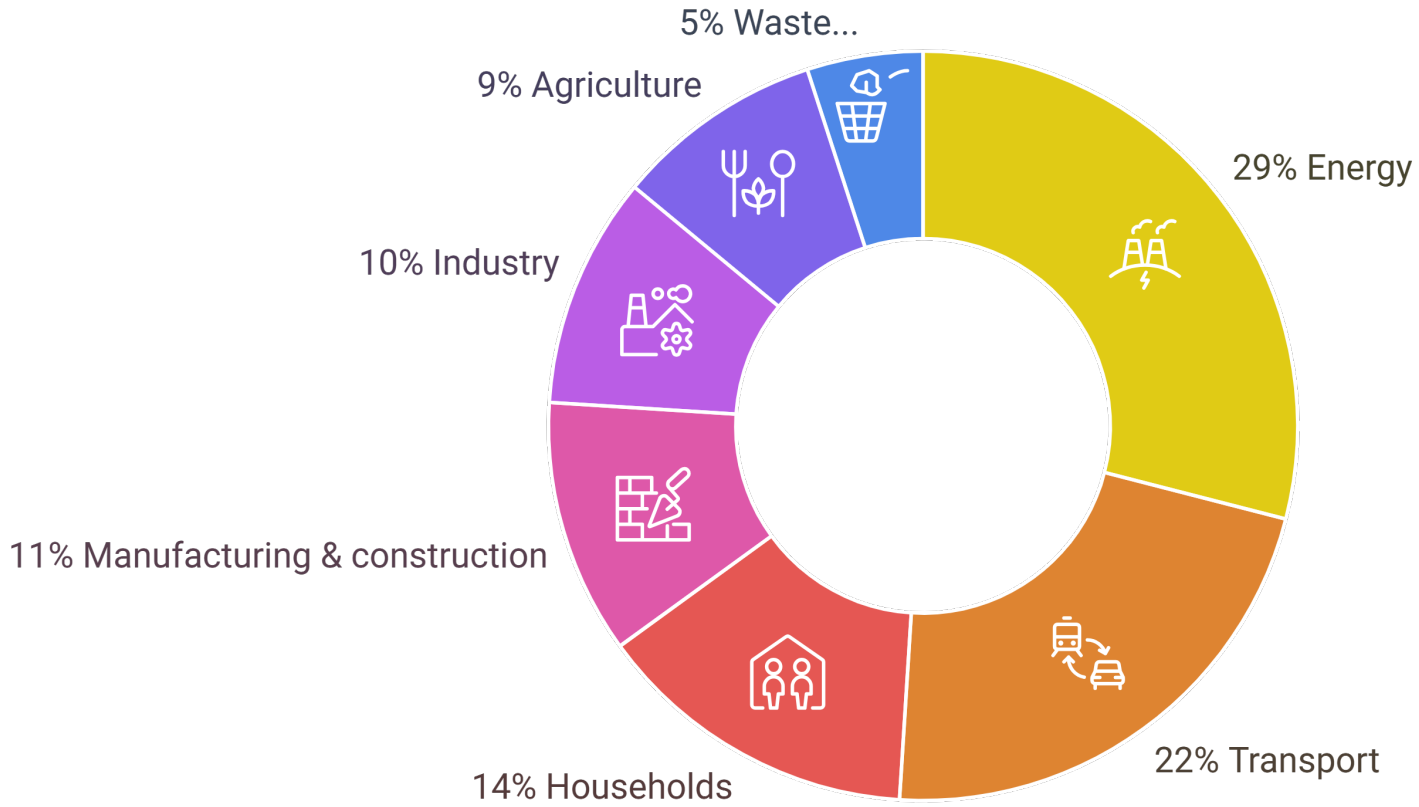
https://climate.ec.europa.eu/eu-action/climate-strategies-targets_en

Construction has its part to play

Impacts are split across:

- Building operations (heating, cooling, lighting, etc.)
- The construction process itself
- Materials
- Embodied carbon (emissions from material production and construction)
- The sector consumes huge amounts of energy and generates large amounts of waste

Total greenhouse gas emissions by sector (%) in EU-27, 2009



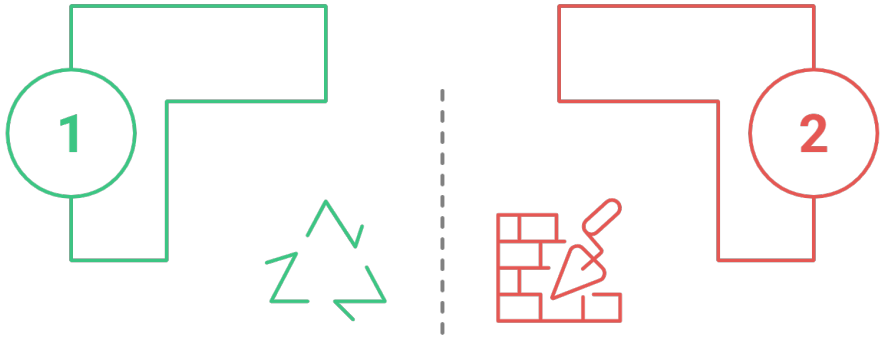
https://www.eea.europa.eu/en/analysis/maps-and-charts/total-greenhouse-gas-emissions-by-sector-in-eu-1

How does water-based suppression play its part in CO_2 generation?

Environmental Impact of Water-Based Suppression Systems

Embedded materials

Raw material choice
Recycled materials
Shipping distances
Design choices
Packaging

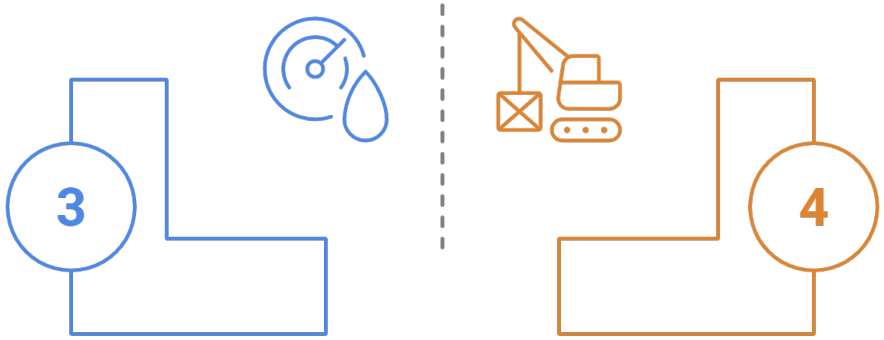


Construction process

Number of workers
Distances driven
Tools & electricity
Waste generated

In-use

Testing demands (water + energy)
Impact of fires
Remote testing



End of life

Ease of recycling
Substances of concern

We already have some great data

Hoyer Brandschutz Report
More sprinklers for climate change mitigation?
May 2023

- Using sprinkler systems can significantly reduce CO_2 emissions. In a comparative study, a total of 45,400 kg of CO_2 in embodied (grey) emissions (materials, construction, deconstruction) and 9,500 kg of CO_2 in operational (red) emissions were saved-about 5% of the building's total emissions over its lifecycle.
- Sprinkler systems allow for less complex fire protection which can reduce the need for materials like gypsum board and mineral wool, which have high embodied energy and are typically not recyclable.
- Sprinkler systems are mostly made of pure metallic materials, which can be easily recycled at the end of their use
- Fewer fire compartments and fire dampers are needed, reducing pressure loss in ventilation systems. This saves up to 1,700 kWh of electricity per system annually
- Sprinkler systems enable the use of low-pollutant insulating materials like cellulose fiber instead of mineral wool. These materials bind CO_2 and can be recycled at the end of their life, while mineral wool must be landfilled.
- In a fire, only the sprinklers above the fire source are activated, enabling targeted extinguishing and significantly reducing water damage compared to large-scale firefighting by the fire brigade.
- With fewer structural fire protection measures, many maintenance tasks (e.g., on fire dampers and doors) are eliminated. Maintenance is focused on the sprinkler control center, saving time and resources.
- Sprinkler systems allow for larger fire compartments and more flexible floor plans, supporting sustainable and circular construction methods. This is advantageous for taxonomy-compliant properties according to EU criteria.
- Despite the investment in sprinkler technology, the reduced need for structural fire protection (walls, doors, dampers) leads to overall cost savings of about 4.9%-equivalent to a reduction in the lower six-digit euro range, conserving resources.

We already have some great data

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Grey emissions are a huge and somewhat ''unseen' issue

New materials:

- Eliminate the CO2 generation during manufacture
- Can soak up Co2
- Can be recycled

But are more flammable and sprinklers can mitigate the increased risk

We already have some great data

BrandForsk
Fire as a factor in life cycle analysis - How does the risk of fire affect buildings' climate impact?
May 2023

- Installing sprinkler systems in buildings such as schools and commercial properties can reduce the climate impact associated with fire risk by 77–88%. This means that, over the building's life cycle, the environmental burden from potential fires is dramatically lessened when sprinklers are present
- The contribution of fire risk to a building's total climate impact can range from 1.5% to 44.2% (6–163 kg CO_2e/m^2) depending on building type. Sprinklers directly reduce this contribution by preventing or limiting the extent of fire damage and the associated emissions
- Sprinklers help prevent total or partial building loss, thereby reducing the environmental impact from manufacturing, transporting, and installing replacement materials after a fire
- Fires release large amounts of greenhouse gases and toxic pollutants. By suppressing fires early, sprinklers minimize these direct emissions, leading to a lower environmental footprint for the building over its life cycle
- The longer a building's lifespan, the greater the cumulative climate impact from potential fires. Sprinklers help preserve buildings over time, reducing the need for major repairs or reconstruction and thus lowering the long-term environmental cost – they also typically last the life of a building with minimal updating needed
- While sprinkler systems themselves have an initial climate impact due to their manufacture and installation, this is outweighed by the much larger reductions in emissions from avoided fires and reconstruction activities
- By reducing fire risk and its associated emissions, sprinklers contribute to the overall sustainability of the built environment, helping to align with climate targets and reduce the carbon footprint of cities and communities

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The consequence of a fire event is assumed to be a function of:

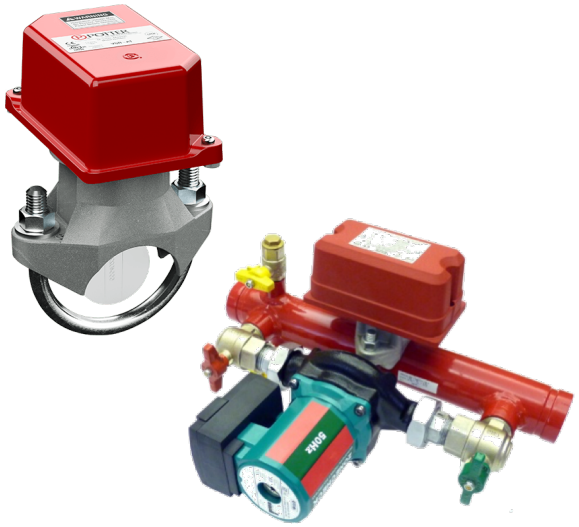
1. Emissions
2. Impact of replacement materials
3. Impact of extinguishing process

	Small house	Apartment	School	Office	Trade
Emissions replacing building materials ($kgCO_2e/m^2$)	208	414	414	412	339
Emissions replacing building materials ($kgCO_2e/m^2$)	108	108	65	75	144

Sprinkler and water mist systems have their part to play

But we can still do more

Mitigation strategies



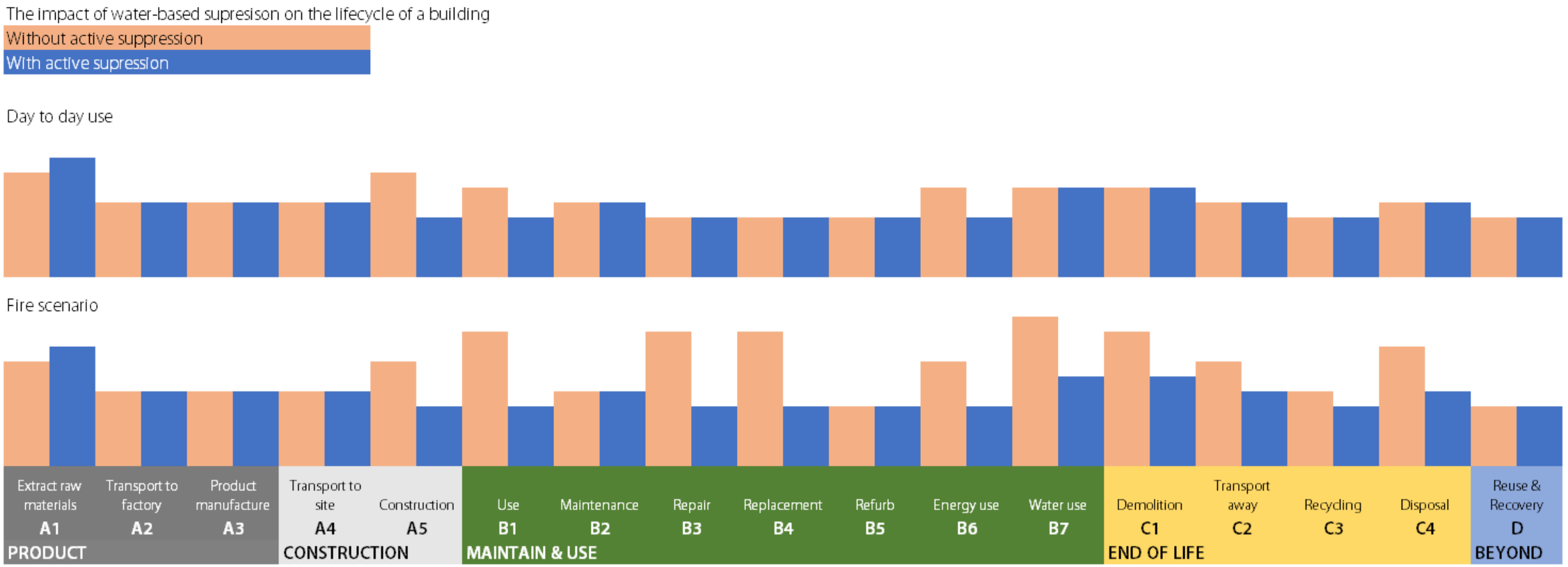
1. Look for alternative materials
   - CPVC instead of steel
   - Increase the % of recycled materials
2. Source from more local suppliers
   - Reduce transportation
   - Environmental Product Declarations – will drive supply chain to improve
3. Improve energy and water efficiency
   - Use a ‘Direct Alarm’ option for weekly testing
   - Flowswitch test devices
   - New remote testing options are coming on-line
4. Adapt the design
   - Look at product choice: EC vs standard sprinklers
   - Water mist vs standard sprinkler protection

Sponsored by the three leading trade associations for the sprinkler and mist market

Project Goals

1. Reframe sprinklers as a key carbon-saving asset, not a design hurdle
2. Highlight that systems can dramatically improve the chances of gaining insurance acceptance (when using carbon-saving materials)
3. Expand current thinking from single building to community consideration
4. Show greater benefits for areas with dense or closely spaced buildings
5. Stress need for tailored suppression design for best performance and minimal damage
6. Position active suppression as crucial for Fire Service support in NetZero builds
7. Prevent under-engineering or over-promising suppression system capabilities
8. Emphasize integration of sprinklers with other safety and resilient design systems

Industry activity – report goals



Fictitious data

Thank you…

…any questions?