LEONARDO ACADEMY
THE SUSTAINABILITY EXPERTS®

Sustainability Assessment and Improvement Strategy Development For the Fire Suppression Industry: An Overview of Issues

A Draft White Paper

By Leonardo Academy Inc.

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This is a Leonardo Academy Inc.

Working Draft

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PREFACE

Leonardo Academy has embarked on a Fire Suppression Sustainability Program. An overview report is an early step in this program. The present working draft is intended to present the case that while fire protection systems are absolutely necessary and vital to any well designed building or facility, there are options for providing fire protection which achieve those goals with less impact on the environment and with increased sustainability. This report hopefully will be a catalyst for discussion of the issues and for industry initiatives to measure the impacts of fire protection systems and to increase the sustainability of these systems over time.

The goals of the Leonardo Academy Fire Suppression Program and steps forward for the program are presented here.

OBJECTIVES

This white paper was prepared and is being issued as a working draft with these goals in mind: 1) to stimulate discussion of the issues of fire protection sustainability; 2) to begin the process of identifying and quantifying the sustainability impacts of the fire suppression industry; and 3) to begin the process of identifying strategies for increasing the sustainability of the fire suppression industry.

COMMENTS AND SUGGESTIONS

Please contact Leonardo Academy if you have any questions, comments, or suggestions for this white paper.

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OVERVIEW OF THE SUSTAINABILITY ISSUES FOR FIRE SUPPRESSION

Fire protection provides significant benefits to society by reducing the loss of life and damage to property from fires. It also prevents the emission of carbon dioxide and other pollutants that would otherwise result from fires. However, all fire protection systems also have negative impacts on sustainability to a greater or lesser degree. It is important to understand that fire suppression and sustainability are not mutually exclusive. We can have both. The goal for improving fire suppression sustainability is to maintain or increase the effectiveness of fire suppression while increasing the sustainability of fire suppression equipment, agents and systems.

The purpose of this report is to explore the sustainability of fire suppression, including its impact on the environment, economic prosperity and social well being. The report will begin by identifying and quantifying the sustainability impacts of the fire suppression industry to the extent practical at this time. The information will be used to begin the process of identifying how the sustainability of fire suppression systems can be improved. The process of data collection and improvement will require that all players in the fire suppression industry be involved, including manufacturers, distributors, and maintenance service personnel as well as building owners, designers, facility managers and occupants.

The goals of this effort are to maintain or increase the effectiveness of fire suppression while increasing the sustainability of fire suppression as listed below.

For the installed base of fire suppression systems:

- Identify the sustainability impacts and risks of installed base.
- Identify the magnitude of the installed base.
- Identify how the sustainability of the installed base can be increased and sustainability risks can be reduced, including consideration of operations, maintenance, upgrades and end of life.
- Provide information and education for supporting designers, building owners and occupants in implementation of the actions identified for increasing the sustainability of the installed base and for reducing the sustainability risks of the installed base.

For new fires suppression systems being designed and installed in the near term:

- Identify the sustainability impacts and risks of currently available fire suppression alternatives.
- Provide information and education supporting designers, building owners and occupants making fire suppression choices that increase the sustainability of the systems being designed and installed.

For the long term:

- Develop frameworks and systems for tracking the types and sizes of fire suppression systems in buildings and the amounts of fire suppression agents present in these systems.
- Develop information and frameworks that provide guidance and incentives for all the industry players to continually increase the sustainability of fire suppression over time.

- Create economic incentives for the fire industry to undertake reclamation of hardware and agents and to address end-of-life management for fire suppression systems.

TYPES OF FIRE SUPPRESSION APPLICATIONS AND THE SYSTEMS AND AGENTS USED

GENERAL BUILDING FIRE SUPPRESSION SYSTEMS

Modern buildings host a multitude of different risks that are best mitigated with some form of fire protection equipment or system. In one building there may be a full gambit of protection, from first aide fire fighting devices to very complicated engineered special hazards systems, while in another building there may be just the minimum of fire protection.

Today the most common form of protection in any building is the standard water sprinkler system. However, within these same buildings a number of other products or systems are installed for protection of high hazard or high value property and processes. These supplemental systems share one common trait, they use some form of chemical agent to protect the facility from fire.

A wide array of chemical agents is used in addition to water. Agents include chemical gases, dry chemical powders, wet chemical agents, and fire fighting foams both fluorinated and non-fluorinated.

Common hazards being protected in buildings include: commercial kitchens; flammable liquid stores; warehouses; computer rooms, switchgear rooms and vital records storage. These areas may be protected simply with portable extinguishers or may use sophisticated total flooding gaseous fire fighting systems.

The protection of these areas involves a creative process where the designer of the overall life-safety scheme weighs risk abatement against financial, aesthetic and passive protection options. In some cases the designers also weigh the impact these systems may have on the environment and sustainability. In most cases there are options that provide equivalent levels of fire protection, but have different environmental and sustainability impacts.

Unfortunately, the information available on the environmental and sustainability impacts of the different fire suppression agents is sparse. To our knowledge there is no comprehensive system of environmental and sustainability evaluation of fire suppression systems. In most cases, if any consideration is given, it is limited to a single system or group of agents and there are currently no attempts being made to quantify the total impact of the combined fire protection equipment and systems in a building. It follows then, that there can be no serious evaluation of which approach will maximize the protection of the building, while minimizing the impact on the environment and increasing sustainability.

Such evaluations cannot be made until there are methodologies that begin to measure the various impacts of different equipment and systems. A framework for evaluating the impacts of different agents and summarizing them in terms of the overall fire protection scheme needs to be created.

LACK OF QUANTIFICATION AND UNDERSTANDING

The most significant challenges ahead for the fire protection industry are that the impacts have not been fully studied and that there is no dependable data on the installed base of fire suppression systems. Therefore, the magnitude of the impacts is as yet truly unknown. As the use of fire protection systems expands, the amount of agents sequestered in them grows. The negative impacts of these sequestered agents may not be known until systems are removed from service many years in the future, by which time the magnitude of the impact may be considerable.

Some make the “Non-Emissive” argument stating that only a small percentage of all agents are ever in fact released. However, this argument would only be valid if structured, well-controlled systems were in place to reclaim and destroy agents at the end of the life of the fire suppression systems. There appear to be very few, if any, organizations with a structured reclamation program. Organizations carrying out reclamation appear to work on a voluntary basis and there is no data indicating how much agent has been taken out of service versus what has been recovered. Currently, with the exception of Japan, no manufacturers have programs to track and recover products from the market.

The fire industry has a history of agents being used for years prior to the impacts being discovered. Examples include ozone depletion and/or global warming agents and fluorosurfactants used in fire fighting foams. The risk of assuming that chemical agents have no impacts can result in catastrophic harm being done to the environment before the impacts are fully understood.

THE NEGATIVE ENVIRONMENTAL IMPACTS OF FIRE PROTECTION SYSTEMS

All fire protection agents are used to achieve a noble purpose. The good these systems provide should never be discounted. However, in order to maximize the benefit of these systems, understanding and then attempting to minimize the negative impacts of these systems is a logical course of action. The challenge is to improve fire suppression systems by understanding the negative impacts they currently have.

All fire suppression systems and agents have negative environmental impacts to a greater or lesser degree. Environmental impacts include the consumption of energy and natural resources and impacts on the atmosphere, water, land, and living things, including people. Within buildings they can negatively impact the building, its occupants and its contents. The major areas of negative impact and the challenges for quantifying these impacts are discussed in this section.

ATMOSPHERIC OZONE DEPLETION

Ozone depletion in the upper atmosphere allows more ultraviolet radiation (UV) to reach the earth. An increase in UV is deleterious to many organisms. People face a greater danger of sunburn, cataracts and skin cancer. UV light is harmful to eyes of other organisms as well. Plankton in the oceans and the pollen of terrestrial plants experience increased mutation rates with the increase in UV exposure. Halons and HCFCs are among the chemicals that destroy ozone in the upper atmosphere.

The capacity of a compound to destroy stratospheric ozone is expressed as its Ozone Depletion Potential (ODP). An ODP is a measure of a compound's ability to destroy stratospheric ozone relative to CFC-11, a chlorofluorocarbon, which is considered to have an ODP of 1. Halon 1301 and Halon 1211, both used for fire suppression, have ODPs of 16 and 7.1, respectively. The hydrochorofluorocarbons HCFC-22 and HCFC-124, also used for fire suppression, have ODPs of 0.05 and 0.022, respectively. The ODPs of common agents are shown in Table 1.

From the 1970's through 1990 the fire protection industry depended heavily on substances with high ozone depletion potential. Under the Montreal Protocol, the use of ozone depleting substances in fire protection in newly installed systems has been virtually curtailed in commercial applications. The use of ozone depleting agents continues in critical use applications such as commercial air craft, explosion suppression and in some military applications. However, there remain unknown amounts of these substances installed in the market without structured programs to assure that they are captured and destroyed at the end of their life-cycle.

GLOBAL WARMING

Global warming is being brought about by the increase of greenhouse gases in the atmosphere. Some greenhouse gases may have atmospheric lives of hundreds or even thousands of years. Greenhouse gases cause global warming by absorbing heat from the earth and preventing its release into space. At the same time, they let in light from the sun, which warms the earth. Due to global warming, glaciers around the world and the polar ice caps are melting, endangering the existence of animals such as polar bears and some walrus and seal species, to name a few. Ocean levels are rising, endangering coast lines and islands. It is thought that global warming is causing more extreme weather events.

The capacity of a compound to trap heat from the earth is its Global Warming Potential (GWP). A GWP is a measure of a compounds ability to trap heat relative to CO_2, which is considered to have and GWP of 1.

The GWPs of common agents are shown in Table 1.

Table 1: Fire Suppression Agent's Greenhouse Gas Global Warming and Ozone Depleting Potentials*			
Greenhouse Gas	Lifetime (years or days)	100-year Global Warming Potential (GWP)	Ozone Depleting Potential (ODP)
Regulated by Montreal Protocol			
Halons			
Halon 1301	65 yrs	7,030	16
Halon 1211	16 yrs	1,890	7.1
Halon 2402	20 yrs	1,640	11.5
Hydrochlorofluorocarbons (HCFCs)			
HCFC-22	12 yrs	1,780	0.05
HCFC-124	5.8 yrs	609	0.022
Not Regulated by Montreal Protocol			
Perfluorocarbons (PFCs)	1,000 - 50,000 yrs	7,390 - 12,200	0
PFC-14 (CF_4)	50,000 yrs	7	0
Hydrofluorocarbons (HFCs)			
HFC-227ea	34.2 yrs	3,220	0
HFC-23	270 yrs	14,800	0
HFC-125	29 yrs	3,500	0
HFC-134a	14 yrs	1,430	0
HFC-236fa	240 yrs	9,910	0
Carbon dioxide (CO_2)	Variable	1	0
Fluoroketones			
FK 5-1-12	3-5 days (0.082-0.014 yrs)	1	0

***Values from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007 and the EPA's Tables of Ozone Depleting Substances**

TOXICITY, BIOACCUMULATION AND PERSISTENCE

A wide variety of fire suppression agents exhibit toxicity, bioaccumulation or persistence in the environment.

Many types of foam contain surfactants that are toxic to aquatic life ranging from microbes to plants to fish. Foams also may cause oxygen depletion in aquatic environments, killing plants and fish. Some of the surfactants, such as PFOS, bioaccumulate and pose a serious persistence issue in the earth's water sources.

While the toxic problems with the fluorinated foams come first to mind, it is important to note that the "Fluorine-Free" foams that are now being marketed against the fluorine based foams have similar aquatic toxicity issues. Perfluorooctanesulfonate (PFOS) is a breakdown product of certain foams. PFOS is persistent and bioaccumulates. It is has been detected widely in people, wild animals and water. It is toxic to aquatic organisms at high doses. The toxicity of low levels to people and other organisms over time is unclear. If it is present in drinking water, water treatment is required.

The dry chemical and liquid chemical agents all share the use of basic salts to perform fire extinguishment. Many of these salts in high quantities are toxic to plants and animals. Most are either caustic or acidic to varying degrees. In many cases, although these agents have been around for many years, the overall impact on the environment, if any, has not been yet been seriously measured or studied.

IMPACTS ON PEOPLE

Some fire suppression agents have negative impacts on people. PFOS and fluoride from foams bioaccumulate and may be toxic. HFCs above a certain level are an inhalation hazard and the products of HFC decomposition as they extinguish fires can be very toxic to humans. Severe exposure to the potassium carbonate used in aerosols may cause respiratory tract damage. There is a danger to building occupants in using inert gas and carbon dioxide because they may decrease oxygen levels below what is required for human life. The use of inert gases and chemical suppression agents presents a risk to people if valves or tanks are damaged, or if excessive pressure develops in a protected space. The organic potassium salts used in liquid agent are caustic.

IMPACTS ON PROPERTY

Fire suppression agents are used to prevent or limit fire damage in buildings; however, they themselves may cause damage to buildings and their contents. In some cases, water is responsible for significant damage where water sprinkler systems are improperly installed or damaged. The use of inert gases and chemical suppression agents presents the risk of damage to the structure due to damage to the valves or tanks, or to excessive pressurization of the protected space. Some agents, such as the organic potassium salts used in liquid agent, are corrosive and may damage building contents.

LIFE CYCLE ASSESSMENT OF IMPACTS

In order to understand the total environmental and sustainability impacts of fire suppression, we need to look at the life cycles of systems and agents. Life cycle assessments identify the sustainability impacts of the agents and systems over the entire life cycle from extraction, to processing and manufacturing, to installation and use, to end-of-life recovery and reuse or disposal.

There is a tendency in the fire protection industry to focus on a single criterion for comparing the environmental impacts of products. For example, decisions on which chemical total flooding system to use are frequently based solely on the GWP of the agents involved, whereas a number of additional criteria need to be evaluated to make a well-balanced decision. Consideration needs to be given to the method of delivery of compounds with the same GWP value, as well as their life-cycle impacts.

Protein foams are a good example of the need to evaluate the life-cycle of a fire protection agent rather than just the end result. Protein foams in their final form appear not to have a tremendous impact on the environment. However, in the process that is used to render the protein from animal effluent, there are significant toxic wastes produced.

The various issues of environmental impact cannot be studied in isolation, but need to be included in the analysis of the overall impact of an agent throughout its life cycle. Starting to use life-cycle assessment is a fundamental step in creating a market where fire protection products are selected on the basis of not only cost and effectiveness, but on their environmental impacts as well.

To understand the total impacts of the industry, we need to quantify the potential impact of fire protection systems in the market as a whole.

THE INTERCHANGABILITY OF SYSTEMS TYPES AND AGENTS

The science of fire protection balances risk against investment. The selection of the type of protection and the extent of protection by the designer is based upon matching the building owner's fire risk adversity against their willingness to invest in fire protection. In most cases, the building owner's fire risk adversity is defined by codes, standards and insurance premiums. Yet in any case, a competent designer has more than one option as to how to mitigate the fire risk and to manage system costs and other attributes.

From sprinklers to explosion suppression systems, there are products on the market which achieve the same level of fire protection but have different attributes which might be considered. These include: cost; aesthetics; cost of maintenance; service life; and of course, impact on the environment. However, to date environmental impact has not become a major predictor of what system is selected. Part of this is due to lack of education on the part of the purchasers, but mostly it is because the values for comparison are not available. Life-cycle analysis is the means to determine those values and make them available for the purchaser to consider.

It is imperative everyone clearly understand that it is not an issue of choosing between adequate fire protection and the environment. It is an issue of understanding what options provide the best fire protection, while having the least impact on the environment. To get to that point, the industry needs to embrace life-cycle assessment of the sum of fire protection installed in a given building.

THE SOCIAL IMPACTS OF FIRE SUPPRESSION SYSTEMS

Fire suppression has a positive social impact in its function of protecting people from injury or death from fire. In addition, fire suppression protects the property, structures and contents that are so important to people's lives. In addition to the benefits of fire prevention, fire suppression systems and agents have positive and negative social impacts throughout the entire life cycle. Negative impacts include the potential toxicity and harm to humans of some fire suppression agents. Positive social impacts include the opportunity for employment and the satisfaction obtained from contributing to fire protection.

By taking a holistic life cycle view of the entire "life safety design" of a building, architects and building owners can begin improving the level of protection they provide, lowering the impact of buildings on the environment and increasing the sustainability of fire suppression systems installed.

GOALS FOR INCREASING THE SUSTAINABILITY OF FIRE SUPPRESSION

As outlined in the Overview of this paper, the goals for increasing the sustainability of fire suppression are to maintain or increase the effectiveness of fire suppression while increasing the sustainability of fire suppression as listed below.

For the installed base of fire suppression systems:

- Identify the sustainability impacts and risks of installed base.
- Identify the magnitude of the installed base.
- Identify how the sustainability of the installed base can be increased and sustainability risks can be reduced, including consideration of operations, maintenance, upgrades and end of life.
- Provide information and education for supporting designers, building owners and occupants in implementation of the actions identified for increasing the sustainability of the installed base and for reducing the sustainability risks of the installed base.

For new fire suppression systems being designed and installed in the near term:

- Identify the sustainability impacts and risks of currently available fire suppression alternatives.
- Provide information and education supporting designers, building owners and occupants making fire suppression choices that increase the sustainability of the systems being designed and installed.

For the long term:

- Develop frameworks and systems for tracking the types and sizes of fire suppression systems in buildings and the amounts of fire suppression agents present in these systems.
- Develop information and frameworks that provide guidance and incentives for all the industry players to continually increase the sustainability of fire suppression over time.
- Create economic incentives for the fire industry to undertake reclamation of hardware and agents and to address end-of-life management for fire suppression systems.

INFORMATION NEEDED TO REACH THESE GOALS

Little public information is currently available about the number of fire suppression systems and quantity of agents that are in service. There are a number of reasons for this. Because manufacturers do not supply agents and systems directly to buildings, they only know how much they sold to a particular distributor, not what or how much ended up at a specific location. Even the total amount of agents and number of systems sold by the manufacturers is not known because the information is considered proprietary. Therefore, even where manufacturers do voluntarily report, those reports are not complete. Information could be obtained from service technicians or distributors, but there are many of them to deal with and they may not keep the information needed.

In addition, there are no regulations for service technicians to report information about fire suppression agents as there are for similar chemicals used in other industries. For example, regulations exist for HFCs used as refrigerants. Service technicians are required to be trained and certified, and must account for refrigerants used. Service technicians are subject to anti-venting regulations for refrigerants used in cars. No such regulations exist for HFCs used in fire suppression.

There is no comprehensive government or non-government system for collecting and maintaining data about fire suppression systems and agents in place and those being installed.

In order to understand the extent of the total impact of fire suppression on the environment and the impact on building emissions inventories and sustainability, we need information about the types of systems in service and the amount of agent they contain. The information needed is as follows:

1. Number of each type of system in service
2. Amount and type of agent in each system
3. The amount of agent lost due to leaks, accidental discharge or use
4. The fate of agent and equipment when systems are decommissioned

Information about fire suppression is needed to understand the negative impacts and potential negative impacts of fire suppression agents and equipment on the environment and sustainability. We need the information to make informed decisions about reducing their impact on the environment, to enforce good environmental practices, and to ensure the responsibility of those in charge of the systems.

Tables 2 and 3 present some of the estimates that have been made of the installed base and annual emissions of some fire suppression agents. We do not know how accurate these estimates are, and we will not know until much more information about the fire suppression industry has been collected.

Table 2: Estimates of Size of global Installed Base for Some Fire Suppression Agents in Years 2010-2015		
Agents	Fixed System or Portable Extinguishers	Metric Tonnes of Agent(s)
HCFCs, PFCs and HFCs	Fixed Systems	3,600 - 67,000
HCFCs, PFCs, HFCs, fluoroketone	Portable Extinguishers	4,000
Halon	Fixed Systems	24,000-31,000
Halon	Portable Extinguishers	19,000-33,000

References:

1. Werner, Kurt, T. and John G. Owens. "Emissions Scenarios and Policy Consideration of for HFCs in Fire Protection." 3M Specialty Materials Division. 4th International Symposium on Non-CO_2 Greenhouse Gases. Utrecht, The Netherlands. July 4-6, 2005.

2. Dyer, Georges. "HFCs in fire Protection Systems: An Invisible and Unnecessary Climate Threat." Greenland Enterprises. Kyoto Publishing. September 2009.

3. Verdonik, Daniel P., H.S. Kaprwan, E. Thomas Morehouse, John Owens, Malcolm Stamp, and Robert Wickham. "Chapter 9: Fire Protection." In: IPCC/TEAP Special Report: Safeguarding the Ozone Layer and the Global Climate System. [Bert Metz, Lambert Kuijpers, Susan Solomon, Stephen O. Andersen, Ogunlade Davidson, José Pons, David de Jager, Tahl Kestin, Martin Manning, and Leo Meyer (eds.)]. 2005. Cambridge University Press, Cambridge, UK: p 364.

Table 3: Estimates of the Million Metric Tonnes of Global Emissions of Some Fire Suppression Agents in Years 2010-2015		
Agents	Fixed System or Portable Extinguishers	Metric Tonnes of Agent(s)
HFCs, PFCs	Fixed Systems	2.74-3.95
HCFCs, PFCs, HFCs,	Fixed Systems	4
HCFCs, PFCs, HFCs,	Portable Extinguishers	0.3-0.34

References:

1. Werner, Kurt, T. and John G. Owens. "Emissions Scenarios and Policy Consideration of for HFCs in Fire Protection." 3M Specialty Materials Division. 4th International Symposium on Non-CO_2 Greenhouse Gases. Utrecht, The Netherlands. July 4-6, 2005.

2. Verdonik, Daniel P., H.S. Kaprwan, E. Thomas Morehouse, John Owens, Malcolm Stamp, and Robert Wickham. "Chapter 9: Fire Protection." In: IPCC/TEAP Special Report: Safeguarding the Ozone Layer and the Global Climate System. [Bert Metz, Lambert Kuijpers, Susan Solomon, Stephen O. Andersen, Ogunlade Davidson, José Pons, David de Jager, Tahl Kestin, Martin Manning, and Leo Meyer (eds.)]. 2005. Cambridge University Press, Cambridge, UK: p 364.

3. Intergovernmental Panel on Climate Change, 2005: Technical Summary of IPCC/TEAP Special Report, "Safeguarding the Ozone Layer and the Global Climate System: Issues Related to Hydrofluorocarbons and Perfluorocarbons". [de Jager, David, Martin Manning, Lambert Kuijpers, et al.]

WHAT NEEDS TO BE DONE

DEVELOP A SYSTEM FOR TRACKING FIRE SUPPRESSION AGENTS AND SYSTEMS

Develop a system for tracking fire suppression agents and systems through their life cycles. One suggestion is to make service technicians responsible for reporting the information needed. Training, certification and reporting could be required for fire suppression service technicians as it is for refrigerant service technicians. In some states fire suppression service technicians are already required to be licensed, but in general enforcement is not strict.

Insurance companies could play a role in providing an incentive for reporting by charging larger premiums for buildings where inspections are not done and service is not provided by licensed service technicians.

Agent and equipment manufacturers might be required to report amounts of agents sold and number, type and size of systems sold. Information could be released in aggregated form to protect the privacy of building owners. Similarly, companies involved in recycling or destroying agents and could be required to report the types and amounts of agent handled and their fate.

ANALYZE THE SUSTAINABILITY IMPACTS OF FIRE SUPPRESSION

Analyze the sustainability impacts of fire suppression systems and agents at the building level as well as at the industry level for the United States as a whole. The investigation will start with those agents that offer the greatest opportunity for decreasing negative environmental impacts.

A survey of building owners and occupants will allow us to begin to quantify the systems and agents that are in use in buildings. As improvements in fire protection system tracking are made, this will provide ongoing improvements in fire protection system data.

DEVELOP LIFE CYCLE ASSESSMENTS OF FIRE SUPPRESSION AGENTS AND EQUIPMENT

Develop life cycle assessments to provide a complete picture of the environmental impacts of agents and systems, including impacts from production, use and decommissioning. Once life cycle environmental impact assessments have been completed, expand the life cycle assessments to include sustainability.

DEVELOP INFORMATION AND EDUCATON TO HELP PREVENT ADOPTION OF MOST DANGEROUS FIRE SUPPRESSION AGENTS IN DEVELOPING NATIONS

It is expected that agents being discontinued in developed nations in order to reduce environmental impacts will be picked up in developing nations as cheap fire suppression options. Developing nations constitute a huge market and demand for fire suppression there is growing. This presents a huge environmental risk. We need to develop strategies to make sure that developing nations benefit from the experience of developed countries, and skip the most environmentally dangerous agents in their development of fire suppression. Financial incentives to developing nations may be needed to make sure that this occurs.

INVESTIGATE END-OF-LIFE ISSUES FOR FIRE SUPPRESSION AGENTS

Neither the government nor the private sector tracks or regulates what happens to fire suppression agents when systems are decommissioned. Environmentally friendly actions would be to recycle the agents or destroy them appropriately. At least for some agents such as HFCs, it would appear on the surface that the number and capacity of recycling firms is too small to process the amounts of agent in the installed base at system decommissioning. Appropriate destruction of agents may be difficult and costly. For most agents, there are no monetary incentives in place to encourage environmentally friendly destruction of agents. The easiest action, which is one that has a negative impact on the environment, is to simply release agent to the environment.

Because of the lack of tracking, regulation and monetary incentives, we can expect that significant amounts of the agents presently in place, including halons, HCFCs, HFCs and foams degrading to PFOS, will eventually be released to the environment at the end of system life. But we don’t know what the magnitude of the releases will be.

To reduce releases of fire suppression agents at system decommissioning, there need to be regulations and incentives for recycling, capture or destruction of fire suppression agents at the end of system life. Monetary support for destruction of agents may be necessary.

NEXT STEPS IN THE PATH FORWARD FOR THE LEONARDO ACADEMY FIRE SUPPRESSION SUSTAINABILITY PROGRAM

1. Carry out a general survey to explore the extent of awareness of fire suppression environmental and sustainability issues
2. Perform a detailed survey of fire suppression systems for a cross section of building types
3. Develop field research to evaluate the sustainability impacts of alternative systems and agents
    a. On site impacts
    b. Life cycle impacts
4. Use surveys and field research to:
    a. Estimate the installed base of fire suppression agents
    b. Estimate the contribution of fire suppression to building emissions footprints
5. Develop preliminary guidance for increasing the sustainability of fire suppression
6. Encourage the USGBC to include a treatment of fire suppression in future LEED-EB O&M rating systems

The results of each step in this project will be released as they are completed.

This overview document was prepared to present the scope of the problem of understanding the sustainability impact of fire suppression and to identify the steps this project will take toward increasing the sustainability of fire suppression systems.

PROJECT FUNDING

Tyco International has provided initial funding for this project. Any other organization that would like to donate to, or provide ongoing funding for the project should contact:

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