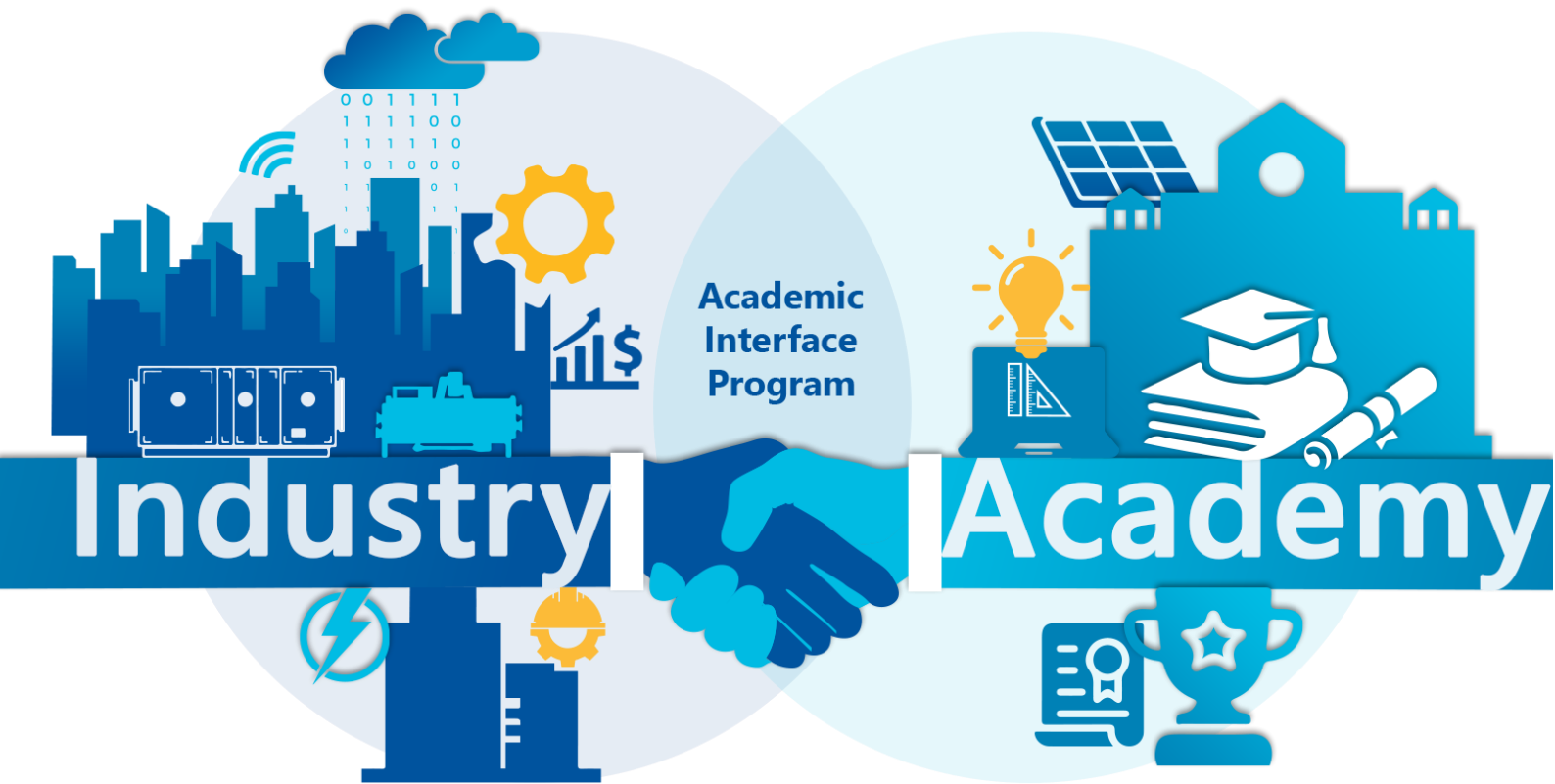




# Tech Challenge Tech Connections

The future is being built today, and Johnson Controls is making that future more productive, more secure, and more sustainable. We create intelligent buildings, efficient energy solutions and integrated infrastructure that work seamlessly together to deliver on the promise of smart cities and communities. At its core, that promise is about delivering innovation that make people's lives – and the world – better.



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## Problem Statements

### 1 - New Environment friendly and efficient refrigerant for HVAC industry

#### **Problem Statement:**

Introduction and implementation of new refrigerant into HVAC Industry that is Environment friendly (Global warming potential\_ **GWP** < 5 and Ozone depletion potential\_ **ODP**-0) and more efficient compared to existing R410A

#### **Background:**

Existing refrigerants that are used in the HVAC industry are R-22, R-410a, R-134a refrigerants or hydrofluorocarbon (HFC) refrigerants since the last 20~25 years. It has high global warming potential (GWP: R22 – 1810, R410a – 2088, R134a – 1300) and leakage of refrigerants can cause serious consequences such as ozone layer depletion and contribute to global warming.

Efficiency: The U.S. Department of Energy (DOE) raised the lowest efficiency standards for air-source heat pumps and central air conditioners from 2023. The lowest minimum Seasonal Energy Efficiency Ratio (SEER) standard will be raised to 14 from the current 13 for those in the northern states and 15 for people in the southern states. Similarly Heating Seasonal Performance Factor (HSPF) which describes the efficiency of the heat pump will be raised from 8.2 to 8.8. This increase in efficiency leads to the manufacturing/selling price increase of the equipment which is an additional burden to the end customers in these challenging times.

The study of new refrigerant for the HVAC industry that is environment friendly, having high heat transfer potential, efficient and can be adapted into the industry based on practical feasibility.

#### **Expected Outcome:**

- The refrigerant should be stable and should have low toxicity, chemical stability, together with suitable thermodynamic, physical, and chemical properties.
- The refrigerant should have low inflammability and good miscibility with lubricants.
- Details of various inputs required for a new refrigerant. Describe appropriate technical input data that is relevant for your idea/solutions.
- Detail out the change in the equipment/HVAC unit required to implement your idea and cost associated with it.
- Details of the experiment done to prove your idea when compared to the existing system/refrigerant used in the industry.
- Describe different personas and the corresponding benefits for the idea/solution
- Describe the anticipated challenges (both business and technical) in executing this idea and your recommendations on how to overcome them.

## 2 - Provide a detailed strategy for carrying out a Red Team Assessment of a Cloud native application

Domain	Title	Problem Statement details
Cybersecurity (GPS)	Provide a detailed strategy for carrying out a Red Team Assessment of a Cloud native application	On the surface, a red team engagement and a penetration testing engagement are similar. However, the key objective of a red team assessment is to re-create real-life attacks and get past the defensive controls. This assessment measures how well a organization's detection and response controls are designed. From a holistic standpoint, the red team assessment not just tests it's systems, but it's entire security culture. Hence a sound strategy needs to be put in place so that the entire exercise can achieve its goals.

## 3 - How will you break and secure Bluetooth Low Energy (BLE) devices?

Domain	Title	Problem Statement details
Cybersecurity (GPS)	How will you break and secure Bluetooth Low Energy (BLE) devices?	The Bluetooth Low Energy (LE) radio is designed for very low power operation. Transmitting data over 40 channels in the 2.4GHz unlicensed ISM frequency band. The low energy requirement makes it ideal for mobile apps to communicate with IoT devices with stricter power requirements such as heart rate monitors, proximity sensors etc. However, if implemented insecurely, these devices can be misused in a large scale. There are specific threats to BLE implementations and associated means to fix these vulnerabilities.

#### 4 - Ecofriendly Product Design which emits lesser emissions and doesn't harm environment when scrapped

Domain	Title	Problem Statement details
Sustainability	Ecofriendly Product Design which emits lesser emissions and doesn't harm environment when scrapped	Each and every product these days is manufactured with plastic components and the electronics PCBAs. A lot of harmful components go in it which are not eco friendly and these electronics have a short life span. After the complete life span when these are sent to scrap via e-waste or similar processes, yet a lot of harmful emissions happen which damage our environment. Its time to innovate new ways of creating the Eco friendly products which take a step forward to create a healthy environment.

#### 4 - How do we take a step forward to measure the carbon accounting and find out ways to reduce the carbon emissions

Domain	Title	Problem Statement details
Sustainability	How do we take a step forward to measure the carbon accounting and find out ways to reduce the carbon emissions	<p>Carbon accounting plays a big role to reduce the greenhouse gas emissions. Innovating around sustainable products, services, and performance often requires an understanding of carbon emissions, that divided into three categories. From this carbon accounting model, companies have an overview of their carbon footprint</p> <p>Scope 1 emissions: Carbon emissions that come directly from a company's facilities and vehicles as part of company's operations</p> <p>Scope 2 emissions: Indirectly caused by company's consumption of resources such as fuel and electricity</p> <p>Scope 3 emissions: Indirect emissions that come from a variety of business activities such as transportation, materials and manufacturing, and the use of a company's manufactured products throughout their life cycle.</p>

5 - Enhance the indoor navigation for occupants and improve the location of assets or occupants inside the building with a higher level of precision

Domain	Title	Problem Statement details
Building Solutions	Enhance the indoor navigation for occupants and improve the location of assets or occupants inside the building with a higher level of precision	Buildings are the core for our society, with large building complexes it becomes increasing difficult for new occupants to seamlessly navigate within the buildings, a novel way of providing indoor navigation solution will assist take the user experience to a higher level. At the same time, its important to tag and locate the assets within the building and maintain the location and count of occupants which help accurately evacuate buildings in case of an emergency.

6 - Enhance the indoor navigation for occupants and improve the location of assets or occupants inside the building with a higher level of precision

Domain	Title	Problem Statement details
Fire Detection	Enhance the deterministic sensing technology for detection of fire (Smoke, Heat, etc.) for different applications	The traditional methods of sensing fire inside closed areas are conventional. With the new technology trends there is a scope of detecting fire with the novel ways of sensing which are deterministic and low in cost as compared to the conventional ones.