



Intesis[®]
BY HMS NETWORKS

Revolutionizing HVAC Systems for a More Sustainable Future

An updated whitepaper
with new data and trends.



Introduction to the problem

Heating, ventilation, and air conditioning (HVAC) systems are responsible for a significant share of buildings' energy consumption and greenhouse gas emissions. According to the International Energy Agency (IEA), buildings and construction sectors combined are responsible for over one-third of global final energy consumption and nearly 40% of total direct and indirect CO2 emissions. HVAC systems account for about 40% of the total energy used in buildings, and this percentage is expected to increase in the future due to the growing demand for thermal comfort and air quality in different climates and regions.

Several solutions have been developed and implemented to improve the energy efficiency and environmental performance of HVAC systems, such as renewable energy sources, heat recovery systems, variable speed drives, smart thermostats, building automation systems (BAS), or building management

systems (BMS). These systems allow the monitoring, control, and optimization of the HVAC equipment and its integration with other services, such as lighting, security, fire, and access control.

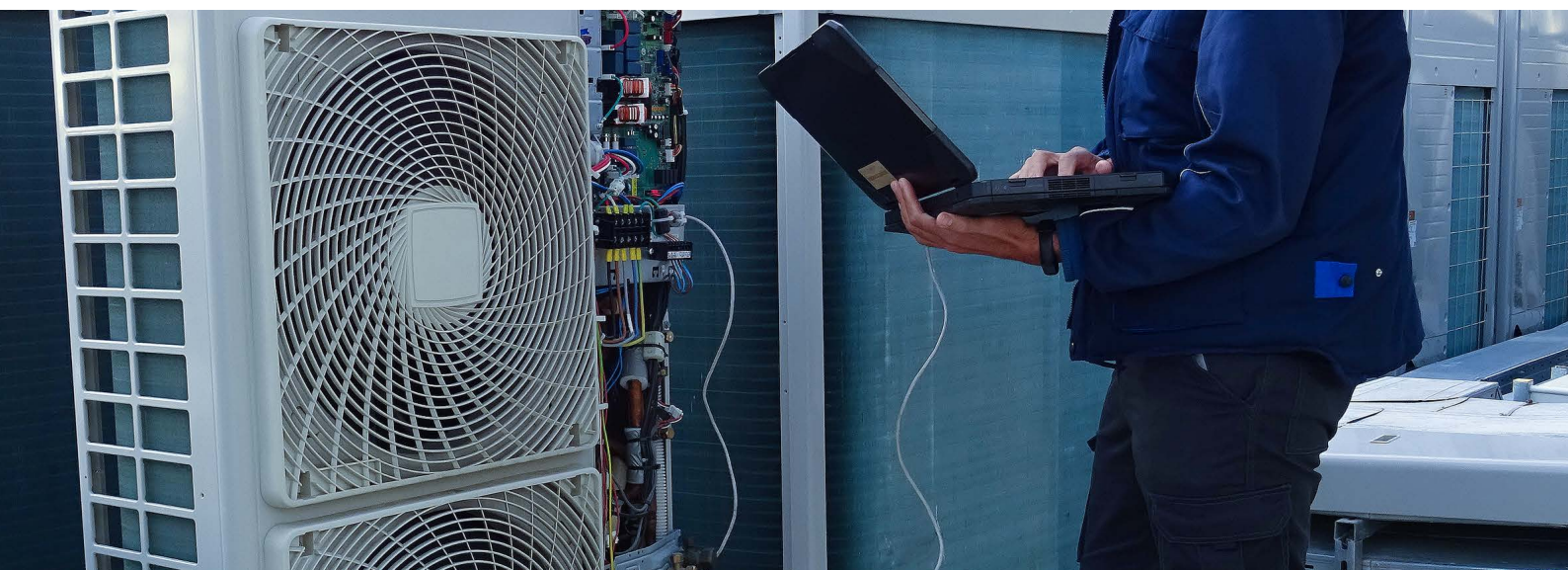
However, not all HVAC systems are compatible or easily integrated with BAS or BMS, especially in existing buildings or in cases where different brands and models of HVAC equipment are installed. This is where Intesis AC gateways come into play. Intesis AC gateways enable communication and interoperability between AC systems and BAS or BMS, regardless of the protocols, standards, or technologies used. They allow the control and supervision of the AC parameters and functions, such as temperature, humidity, fan speed, operation mode, setpoint, alarms, and schedules, as well as the collection and analysis of the AC data for energy management and optimization purposes.



Benefits of the HVAC integration and control

By connecting HVAC systems to BAS or BMS using Intesis AC gateways, several benefits can be achieved in terms of energy savings and CO2 emissions reduction. Some of these benefits are:

- **Improved HVAC performance and efficiency**, by adjusting the HVAC settings and operation according to the actual needs and conditions of the building and its occupants.
- **Reduced HVAC energy consumption and costs**, by avoiding unnecessary or excessive heating or cooling, and by implementing energy-saving strategies, such as demand response, peak shaving, load shifting, and predictive maintenance.
- **Lowered HVAC environmental impact**, by reducing the CO2 emissions associated with the HVAC energy use, and by enhancing the integration of renewable energy sources, such as solar, wind, or geothermal.
- **Increased comfort and satisfaction**, by providing a more consistent and personalized thermal environment and air quality for the building users and occupants.
- **Enhanced HVAC data availability and transparency**, by enabling the access and visualization of the HVAC data and performance indicators, such as energy consumption, CO2 emissions, indoor temperature, and humidity, through the BAS or BMS.



The new milestone, more than 1.5 million AC units connected



Intesis AC gateways control more than 1.5 million aircon devices across the world. Since the start of this line of products in 2009, every year thousands of new AC units are integrated into BMS or BAS using AC gateways.

The first gateway for air conditioning systems developed by Intesis was a 1:1 KNX gateway for Mitsubishi Electric, it enabled the integration of one single indoor unit into a KNX installation, while the last addition to the family was the 700 Series Air, one gateway that allows the BMS to control several AC units, both indoor and outdoor, that also enables energy meters so the BMS can access the HVAC system's energy consumption data. For this product family, Intesis developed a Power Estimation Algorithm (PEA) in collaboration with the leading AC brands, to calculate the energy consumption of each indoor unit in a VRF installation, providing users with valuable insights into energy usage.

Intesis portfolio covers all major AC brands (in alphabetical order: Bosch, Daikin, Fujitsu, Haier, Hisense, Hitachi, LG, Midea, Mitsubishi Electric, Mitsubishi Heavy Industries, Panasonic, Samsung, and Toshiba), with both 1:1 and multiple-indoor-unit versions.

Intesis AC gateways are deployed in hotels, the retail sector, data centers, and residential installations. They are also valuable for zoning applications because the gateway's common register map enables a unique driver for any AC brand integration into the zoning controller's central logic.

How much energy and CO2 emissions can be saved?

The energy and carbon footprint of 1.5 million AC units is enormous, and that's why Intesis' achievement is so important. To estimate the energy savings achieved, we should know that the energy consumption of a standard split air conditioning unit varies depending on factors such as its efficiency rating, capacity, usage patterns, climate conditions, and the specific model reference.

Based on industry benchmarks, the energy consumption of the same standard unit in cooling mode will be anywhere from 1,000 kWh/year to 2,000 kWh/year, while in heating mode it can range from 1,500 kWh/year to 2,500 kWh/year.

To calculate the resulting annual energy consumption, you would add the energy consumption for cooling and heating modes. So, the yearly energy consumption for a standard split air conditioning unit will be from 2,500 kWh/year to 4,500 kWh/year.

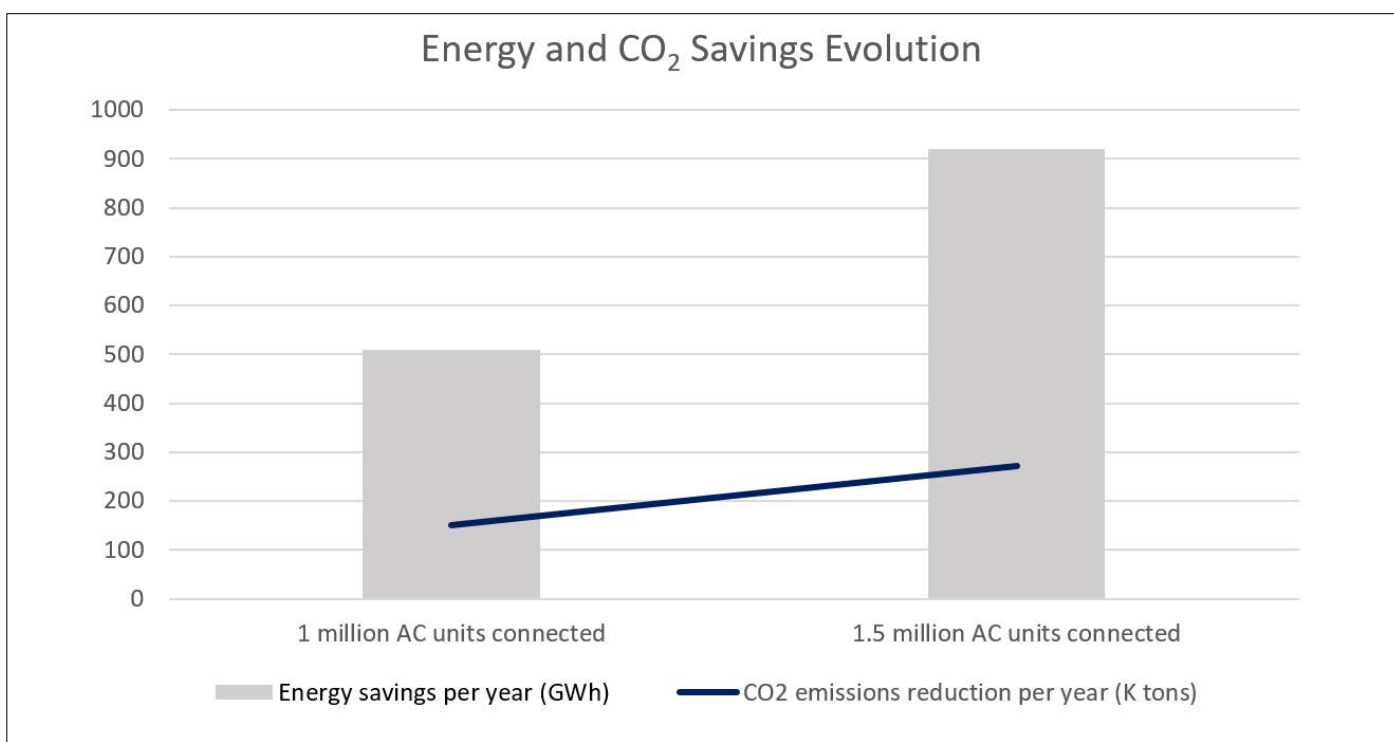
To quantify the energy savings and CO2 emissions reduction achieved by Intesis customers when connecting AC systems to BAS or BMS, we will use reports from the European Union, The International Energy Agency, and the Department of Energy & Climate Change. The data will be divided per region, considering the intrinsic weather conditions, the population's lifestyle, and the usage of renewable energy sources.

| Region | Number of AC units connected | Average energy consumption per AC unit (kWh/year) - without Intesis | Average CO ₂ emissions factor (kg CO ₂ /kWh) | Energy savings (GWh/year) - with Intesis | CO ₂ emissions reduced (tons/year) |
|---------------|------------------------------|--|--|---|---|
| Europe | 1,118,375 | 3,000 | 0.40 | 1,007 | 402,615 |
| North America | 190,596 | 3,750 | 0.50 | 214 | 107,210 |
| Asia | 189,021 | 4,500 | 0.80 | 255 | 204,143 |
| Australia | 47,255 | 4,500 | 0.85 | 64 | 54,225 |
| Latin America | 6,301 | 3,000 | 0.50 | 6 | 2,835 |
| Other | 23,628 | 3,000 | 0.30 | 21 | 6,379 |
| Total | 1,575,176 | - | - | 1,567 | 777,408 |

Revolutionizing HVAC Systems for a More Sustainable Future

Several customers from the retail sector report energy savings between 20% and 45% when using Intesis AC gateways. Assuming an average of 30% energy savings across the different projects, Intesis AC gateways help to save 1,567 GWh per year. According to the average CO₂ emissions factor defined by the International Energy Agency (2023), this results in 777,408 tons of reduced CO₂ emissions.

If we keep the same average energy consumption per AC unit as we used three years ago, when 1 million AC units were connected, the total has increased by 80%.



This shows the positive impact and the scalability of Intesis solution for the HVAC industry and the environment. One of the key drivers for achieving this increment in savings is the market growth for the centralized control of multiple indoor units using a single gateway.

With the Intesis 700 Series Air's launch, more AC units can be integrated using fewer gateways. It is easier now to adapt the gateway's capabilities to different project sizes, as they are available in multiple licenses depending on the indoor units that can be controlled (from 4 up to 128). This factor, and the new energy-savings functions incorporated, such as the Power Estimation Algorithm to estimate each indoor unit's energy consumption, help Intesis customers to reach unprecedented savings.

What does it mean for the planet?

To set these figures in perspective, the obtained energy/CO₂ savings are equivalent to:



The annual energy consumption of a city with 447,676 inhabitants (assuming a global average annual energy consumption per capita of around 3,500 kWh).



The CO₂ that 31,096,337 trees absorb in one year.



The carbon sequestered by about 310,000 acres of forest in one year (assuming an average sequestration rate of 2.5 tons of CO₂ per acre per year.)



712,565 flights between Barcelona and Japan or 12,124 round-the-Earth flights.



The annual energy consumption of about 1 million electric cars.



Powering about 31 million LED TVs for one year.



Trends and regulations in the HVAC industry

In addition to energy savings and CO2 emissions reduction, connecting HVAC systems to BAS or BMS using Intesis AC gateways also allows the HVAC industry to adapt and respond to the new trends and regulations that are emerging in the global market. Some of these trends and regulations are:

AIR-TO-WATER HEAT PUMP CONTROL:

Air-to-water heat pumps are devices that use the ambient air as a heat source to provide heating or cooling to water circuits, which can be used for space heating, domestic hot water, or pool heating. Air-to-water heat pumps are considered renewable energy sources, as they utilize ambient heat from the environment, which is naturally replenished. Intesis HVAC gateways enable the integration and control of air-to-water heat pumps with BAS or BMS, for the optimization of the heat pump performance and efficiency, as well as the coordination with other systems of the building.

NEW REGULATIONS, NORMS, AND LAWS FOR ENERGY EFFICIENCY WORLDWIDE:

Several countries and regions have implemented or are planning to implement new regulations and laws to promote energy efficiency and CO2 emissions reduction of the HVAC systems in buildings, both in new constructions and in existing ones. Some examples of these regulations and laws are:

- **Energy Performance of Buildings Directive (EPBD) (Europe):** Sets minimum energy performance standards for buildings and requires the installation of building automation and control systems in non-residential buildings with a total useful floor area of over 290 m².
- **The Merton rule (UK):** Requires new developments to generate at least 10% of their energy needs from on-site renewable energy sources. This rule aims to promote sustainability and reduce carbon emissions in the new construction market. This can involve implementing energy-efficient HVAC equipment, optimizing system design for better performance, and incorporating smart controls and sensors to regulate heating, cooling, and ventilation based on real-time occupancy and environmental conditions.
- **The International Energy Conservation Code (IECC) (US):** This is a model energy code widely adopted by states and municipalities across the US. It establishes minimum energy efficiency requirements for new residential and commercial buildings. States and local jurisdictions often modify and adopt versions of the IECC tailored to their specific climate and energy goals.

- **Building Energy Efficiency Standards (BEES) (Japan):** Japan's Building Energy Efficiency Standards, established under the Building Energy Conservation Act, set mandatory energy efficiency requirements for new buildings and major renovations. These standards cover various aspects of building design and construction, including thermal insulation, HVAC systems, lighting, and renewable energy utilization.
- **Green Mark Scheme (Singapore):** This rating system evaluates the environmental impact and performance of buildings. The Building and Construction Authority (BCA) oversees the Green Mark Scheme, a voluntary certification program that promotes environmentally sustainable buildings through energy efficiency, water efficiency, or indoor environmental quality where HVAC systems play the main role.

Intesis AC gateways help the HVAC industry to comply with these regulations and laws, by facilitating the integration and control of the HVAC systems with BAS or BMS, and by providing the data and information needed to demonstrate the energy efficiency and the CO2 emissions reduction of the HVAC systems.

CENTRALIZED CONTROL FOR MULTIPLE INDOOR UNITS:

Centralized control allows for better optimization of energy usage across multiple indoor units. By coordinating the operation of various units based on the overall building's needs, energy wastage can be minimized. This is particularly important in large buildings where individual units operating independently might lead to inefficient energy consumption.

Efficient energy usage translates directly into cost savings for building owners and operators. By centrally controlling multiple indoor units using only one gateway, they can better manage energy expenses and reduce overall operational costs. It also simplifies the management of HVAC systems in large buildings, instead of dealing with individual units scattered throughout the building, facility managers can monitor and adjust settings from a centralized location, streamlining maintenance and troubleshooting processes. These systems are often designed to be scalable, meaning they can accommodate the needs of buildings of varying sizes and complexities. Additionally, they offer flexibility in terms of adding or modifying HVAC zones as building layouts change or evolve.



THE ROLE OF HMS - INTESIS 700 SERIES AIR

Listening to that market need, Intesis launched the Intesis 700 Series Air. The gateways that as mentioned before, can combine multiple AC brands and building automation protocols within the same hardware, providing the estimation of each indoor unit's energy consumption.

By using a late configuration process, this innovation helps integrators decide the brand/building protocol combination they need for each project. It also helps distributors reduce the number of different order codes to stock, simplifying inventory management.

These gateways demonstrate the flexibility of HVAC automation technology and set a new standard for adaptability in the industry. It is certified for all automation protocols and markets and has been developed with collaboration and approval from the main AC brands.

Beyond its technological capabilities, Intesis 700 Series Air gateways offer significant value for building owners and occupiers, by enabling the energy consumption estimation for each indoor unit and facilitating its integration into building management systems. This allows users to optimize energy-consuming units, resulting in lower energy bills, lower carbon emissions, and longer lifespan of the HVAC equipment.



Conclusion

Intesis AC gateways are a powerful and versatile solution that enables communication and interoperability between HVAC systems and BAS or BMS, regardless of the protocols, standards, or technologies used by each system. By connecting HVAC systems to BAS or BMS using Intesis AC gateways, several benefits can be achieved in terms of energy savings, CO₂ emissions reduction, comfort, and data availability. Moreover, Intesis AC gateways allow the HVAC industry to adapt and respond to the new trends and regulations that are emerging in the global market, such as air-to-water heat pump control and energy performance standards. Intesis AC gateways are the ultimate solution for the HVAC industry and the environment.



Summary

In an era where sustainability and energy efficiency are paramount, the role of HVAC systems in buildings cannot be overstated. As the demand for comfort and climate control grows, so does the need for smarter, more efficient HVAC solutions. At HMS, with Intesis products for smarter building automation, we've been at the forefront of this revolution, empowering our customers to achieve significant energy savings and reduce carbon emissions through the integration of our Intesis AC gateways with Building Management Systems (BMS) and Building Automation Systems (BAS). The calculations in savings are all stated in this document.



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David Garcés Managing Director of BU Intesis, HMS' division for building automation. He holds an M.Sc. in electrical engineering and an MBA. David has 20 years of experience in factory and building automation and has driven the success of the Intesis brand in this market since more than 7 years ago.

