Opportunity Assessment for U.S. Industry: Energy-Efficient Cooling Technologies in Mexico

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AC - Air Conditioner/Air Conditioning
AHRI - Air-Conditioning, Heating, and Refrigeration Institute
ANCE - Asociación Nacional de Normalización y Certificación (National Association for Standardization and Certification)
ANFAD - Asociación Nacional de Fabricantes de Aparatos Domésticos (National Association of Appliance Manufacturers)
BSRIA - Building Services Research and Information Association
CAGR - Compound Annual Growth Rate
CHIPS - Creating Helpful Incentives to Produce Semiconductors
CSA - Canadian Standards Association
DC - Direct Current
EER - Energy Efficiency Ratio
EXV - Electronic Expansion Valve
FDI - Foreign Direct Investment
FIT - Flexible Inverter Technology
GWP - Global Warming Potential
HE - Heat Exchanger
HFC - Hydrofluorocarbon
HVAC - Heating, Ventilation, and Air Conditioning
INEGI - Instituto Nacional de Estadística y Geografía
IoT - Internet of Things
JRAIA - Japan Refrigeration and Air Conditioning Industry Association
K-CEP - Kigali Cooling Efficiency Program
LBNL - Lawrence Berkeley National Laboratory
MEPS - Minimum Energy Performance Standards
NOM - Norma Oficial Mexicana (Mexican Official Standard)
OBM - Original Brand Manufacturer
ODM - Original Design Manufacturer
OEM - Original Equipment Manufacturer
R&D - Research and Development
RAC - Room Air Conditioner
RT - Refrigeration Ton
SEER - Seasonal Energy Efficiency Ratio
TXV - Thermostatic Expansion Valve
UA - Overall Heat Transfer Coefficient
UNEP - United Nations Environment Programme
USMCA - United States-Mexico-Canada Agreement
W/W - Watt per Watt

EXECUTIVE SUMMARY

Mexico's rapidly expanding room air conditioner[1] (AC) market presents a strategic opportunity for U.S. manufacturers to strengthen North American supply chains while addressing critical energy infrastructure challenges. With demand for room AC units in residential and commercial buildings projected to drive a 26 GW increase in Mexico's peak electrical load by 2050, high-efficiency air conditioning systems offer both substantial market opportunities and essential grid stability benefits.

Market Opportunity and Growth Trajectory: The Latin American and Caribbean room AC market is projected to reach 20 million units annually by 2030, with Mexico representing approximately 1.3 million units valued at nearly $600 million. Conservative growth projections of 4.5% annually position this as one of the region's most dynamic cooling markets, driven by rising temperatures, urbanization, and increasing household incomes. Mexico's current 44% inverter technology adoption rate significantly lags behind global leaders (90-100%), indicating substantial potential for efficiency improvements.

Supply Chain Vulnerabilities and Strategic Imperatives: China's dominance in global room air conditioning manufacturing—controlling 82% of production and up to 90% of critical components—creates profound supply chain risks amplified by recent export restrictions on gallium, germanium, and rare earth elements essential for high-efficiency systems. Recent Mexican tariff measures targeting imports from non-trade agreement countries, combined with increasing U.S. pressure to secure North American supply chains and an ongoing USMCA review emphasizing substantially higher U.S.-manufactured content in key sectors, create a favorable policy environment for nearshoring initiatives. U.S. manufacturers shifting production from China to Mexico could reduce operating costs while achieving logistics costs and lead time improvements.

Economic Impact and Revenue Potential: Analysis reveals substantial revenue opportunities across two strategic approaches:

- **Component Manufacturing**: U.S. suppliers of advanced control systems, precision compressors, and refrigerant management technologies could capture $220-275 million in annual premium component revenues across Latin America by 2030
- **Complete System Manufacturing**: U.S. companies pursuing integrated manufacturing strategies could generate $1.4-1.7 billion in factory gate revenues across Latin America and the Caribbean region.

These projections reflect conservative 15% sales market share assumptions for Latin America and the Caribbean and focus on high-efficiency segments where technological differentiation supports premium pricing. These findings support potential U.S. manufacturing strategies with minimum U.S.-manufactured content requirements, consistent with current North American manufacturing and trade priorities.

Technology Leadership Opportunities: The transition to advanced refrigerants required by the Kigali Amendment commitments creates immediate demand for sophisticated safety systems, advanced

[1] Room air conditioner in this context follow the global definition, which encompasses mini-split systems, window units, and portable units designed for cooling individual rooms. This differs from the U.S. market where "RAC" typically refers primarily to window units. Globally, including in Mexico, mini-split systems dominate the RAC market segment, while window units are more common in the United States.

controls, and precision engineering—areas where U.S. manufacturers maintain technological leadership. CHIPS Act investments in domestic semiconductor production directly support the advanced control electronics that differentiate high-efficiency systems.

Energy Security and Infrastructure Benefits: High-efficiency air conditioning systems achieving SEER ratings of 4.7-5.7 W/W (16.0-19.4 Btu/W) can reduce individual unit electricity consumption by 30-50% during peak demand periods, directly addressing Mexico's grid stability and peak load supply-capacity expansion challenges. By reducing peak load, high-efficiency cooling also supports reliable baseload generation, complementing investments in firm power resources such as nuclear and geothermal energy. This positions AC manufacturers as infrastructure solution providers in addition to being consumer goods suppliers, creating opportunities to engage utility companies and government agencies prioritizing long-term energy security.

Employment and Regional Economic Impact: Conservative projections indicate total employment impacts of up to 10,000 direct and indirect jobs across both countries, with U.S. positions concentrated in high-skill component manufacturing, engineering, and systems integration roles typically offering above-average manufacturing wages and jobs in Mexico focused on assembly and operational production roles. This distributed job creation model leverages each country's competitive advantages while strengthening regional economic integration.

Strategic Implementation Framework: Success requires coordinated action leveraging CHIPS Act semiconductor investments, establishing strategic partnerships with Mexican manufacturers for cost-effective assembly, and focusing initial market entry on high-efficiency segments where technological differentiation supports premium pricing. Recent regulatory developments, including the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) and Canadian Standards Association (CSA) harmonization agreement creating unified standards across U.S. and Canadian markets, further reduce barriers to North American manufacturing collaboration. Similar harmonization involving Mexico could further reduce barriers to manufacturing collaboration while facilitating market access across the region.

Methodological Contribution: Beyond Mexico's air conditioning sector specifically, this analysis demonstrates a replicable framework for product-level supply chain assessment—combining market sizing, technology evaluation, component-level cost modeling, and economic impact quantification—that can be systematically applied to other manufactured goods where concentrated Asian production, growing regional demand, and high-value component opportunities create strategic nearshoring potential.

1 Introduction

The growing demand for cooling technologies in Mexico and across Latin America presents a strategic opportunity to reshape North American manufacturing capabilities. Driven by rising living standards, increasing household incomes and urbanization, Mexico's cooling market is expanding rapidly, with cooling electricity consumption projected to grow by a factor of 6 in the residential sector by 2050, contributing to a 26 GW increase in peak load that will require significant investment in capacity expansion (McNeil et al., 2018). Similarly in Latin America and the Caribbean, while current ownership of air conditioners (ACs) is around 15%, it is projected to quadruple by 2050 (IEA,2023). This will create a massive demand for cooling equipment in the coming decades.

Recent empirical evidence reveals this opportunity is both larger and more urgent than previously understood. Air conditioning adoption in Mexico has accelerated dramatically, exceeding academic predictions by 43% over just 12 years, with particularly pronounced growth in warm regions (Davis and Gertler, 2025). This acceleration is driven not only by demographic trends, but also by fundamental shifts in the economics of cooling—including declining real electricity prices and improving AC energy efficiency, which have reduced the total cost of cooling by approximately 30% since 2010.

While global cooling equipment production is currently concentrated in China, Mexico's proximity to U.S. markets, established manufacturing infrastructure, and skilled workforce create unique opportunities for developing more resilient regional supply chains. This strategic pivot toward regional manufacturing aligns with broader supply chain diversification trends, as recent analysis indicates that U.S. manufacturers shifting production from China could reduce logistics and supply chain costs by 23% through nearshoring to Mexico, primarily from lower transportation expenses (PwC, 2020). An ongoing USMCA review emphasizing substantially higher U.S.-manufactured content in key sectors adds further policy momentum behind North American supply chain integration. Recent analysis by Lawrence Berkeley National Laboratory (LBNL) reveals that China's overwhelming dominance—accounting for 82% of global room air conditioners[2] production and controlling up to 90% of critical components like compressors—creates profound supply chain risks for North American markets (Shah et al., 2025). With global room AC sales projected to increase more than five-fold by 2050, diversifying manufacturing capabilities away from this concentrated supply chain becomes increasingly critical for energy security and economic resilience.

This study examines opportunities to advance energy-efficient cooling equipment manufacturing in Mexico, with a particular focus on mini-split ACs, which represent the dominant room cooling technology across Latin America. The research explores how U.S. manufacturers can access new market opportunities while strengthening North American value chains and manufacturing capabilities.

[2] Room air conditioner in this context follow the global definition, which encompasses mini-split systems, window units, and portable units designed for cooling individual rooms. This differs from the U.S. market where "RAC" typically refers primarily to window units. Globally, including in Mexico, mini-split systems dominate the RAC market segment, while window units are more common in the United States.

Key objectives include:

- **Supply Chain Analysis**: Comprehensive assessment of current manufacturing, distribution, and import channels for room ACs in Mexico, identifying opportunities for regional integration
- **Technology Assessment**: Analysis of the current state and growth potential of high efficiency ACs adoption in Mexico compared to global benchmarks, with identification of high-value components suitable for U.S. manufacturing
- **Cost Structure Evaluation**: Detailed breakdown of manufacturer costs for high-efficiency models
- **Economic Impact Assessment**: Evaluation of potential market opportunities for U.S. manufacturers of premium components, including job creation and value capture potential
- **Strategic Implementation Recommendations**: Strategic directions for strengthening regional manufacturing capabilities through U.S.-Mexico collaboration

By building upon Mexico's existing manufacturing infrastructure, this assessment provides a roadmap for creating more resilient, efficient, and competitive cooling supply chains that can deliver economic benefits while accelerating the adoption of energy-efficient technologies.

While focused on Mexico's air conditioning market, this study demonstrates a systematic product-level supply chain analysis framework with broader applicability across manufacturing sectors. This analytical approach —combining market sizing, technology evaluation, component-level cost modeling, and economic impact quantification— can be replicated for other product categories—from electronics and power equipment to industrial machinery—where similar dynamics exist: concentrated production in Asia, growing regional demand in Latin America, established manufacturing infrastructure in Mexico, and opportunities for U.S. manufacturers to capture high-value segments through technological differentiation. By documenting this framework through the lens of air conditioning, we provide a template for identifying and evaluating nearshoring opportunities across diverse manufactured goods facing comparable supply chain vulnerabilities and market conditions.

2 Global and Mexican Room AC Market Analysis

This section examines the room AC market dynamics and supply chain structures, from global trends to Mexico's specific market conditions. Mini-split systems are the focus of this analysis as they represent the dominant room air conditioning technology in Mexico and most markets outside the United States. The market and supply chain analysis covers supply and demand patterns at both international and domestic levels, profiles key industry players, and evaluates manufacturing models in Mexico. It also assesses technological developments in the sector, particularly the shift toward compressor inverter technology, and concludes with an examination of market prices.

2.1 Global Room AC Market: Supply and Demand Analysis

Figure 1 illustrates the geographical distribution of room AC production globally in 2021, based on data from ChinaIOL (Energy Foundation & ChinaIOL, 2021). The global production landscape of air conditioning units demonstrates a stark geographical concentration, with Asian manufacturers, particularly in China, maintaining a commanding position in the market. China leads global production with 154.81 million units, representing 82.1% of worldwide room AC manufacturing. The rest of Asia contributes an additional 27.21 million units, accounting for 14.4% of global output, bringing the total Asian production share to 96.5%.

Production volumes in other regions are notably modest in comparison. South America maintains a marginal presence with 3.09 million units (1.6%), while Europe's production reaches 1.67 million units (0.9%). North America and Africa show similar production levels at 0.9 million and 0.92 million units respectively, each holding a 0.5% share of global production. Oceania's contribution to global room AC manufacturing is negligible.

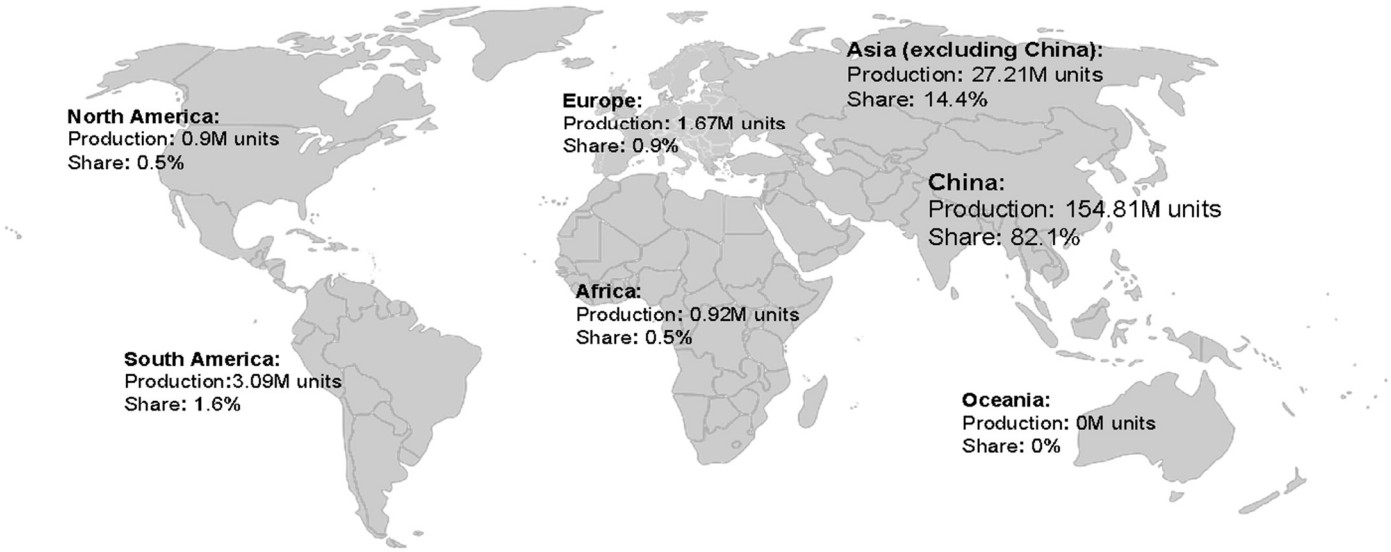

Figure 1 Global Room AC Production by Region (Energy Foundation & ChinaIOL, 2021)

This extreme manufacturing concentration illuminates critical aspects of the global room AC supply chain. China's 82.1% market share represents not only a production powerhouse but also potential vulnerability in the global supply chain. This vulnerability has been further amplified by China's recent restrictions on exporting certain critical minerals essential for manufacturing, including rare earth elements used in high-efficiency motors and semiconductor-grade gallium and germanium crucial for electronic components. The minimal production in major consumer markets like North America and Europe highlights their dependence on imports, primarily from Asian manufacturers, to meet domestic cooling demands.

Figure 2 presents a global view of room AC demand and trade flows in 2021, highlighting regional market shares, demand volumes, and import/export patterns. This visualization captures the relationship between regional production capacities and consumption patterns, highlighting how China serves as both the world's manufacturing center and a major exporter. Meanwhile, regions with limited production capacity rely heavily on imports to satisfy their domestic cooling needs. These trade dynamics reveal the interconnected nature of the global AC market and potential vulnerabilities to supply chain disruptions.

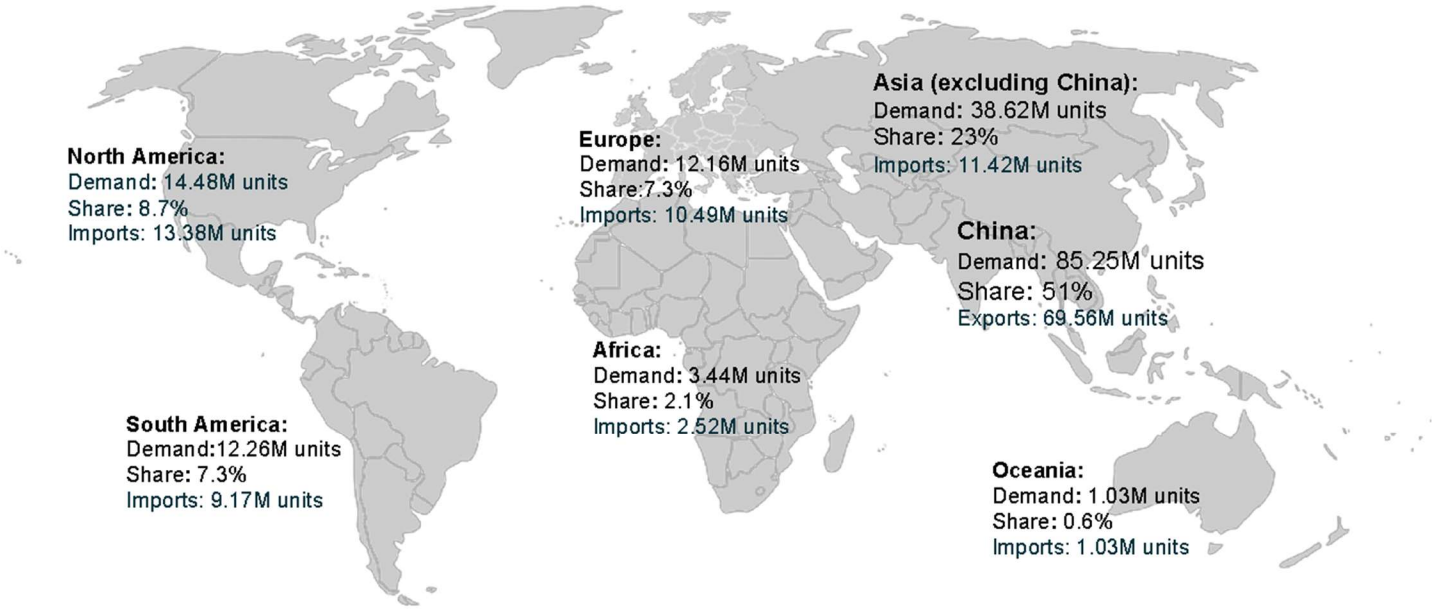

Figure 2 Global Room AC Demand by Region (Energy Foundation & ChinaIOL, 2021)

North America exhibits a significant demand for room air conditioning units at 14.48M units, representing 8.7% of global demand. However, the region's domestic production capabilities are limited to just 0.9M units (0.5% of global production), necessitating substantial imports of 13.38M units to meet market demands. This stark contrast between production and consumption indicates a heavy reliance on international supply chains, primarily from China.

South America shows similar demand levels but different trade dynamics. The region's demand stands at 12.26M units (7.3% of global demand), while maintaining a production capacity of 3.09M units. Despite having higher domestic production capabilities than North America, the region still requires significant imports of 9.17M units to satisfy market needs. This suggests a partial ability to serve domestic markets through local manufacturing, though still heavily dependent on imports.

The Americas as a whole thus represent approximately 16% of global room AC demand while contributing only 2.1% to global production. This substantial gap between regional production and consumption underscores the regions' dependence on international trade, particularly imports from Asia, to meet their cooling needs. The limited domestic production capacity relative to demand may present opportunities for expanding local manufacturing capabilities or developing stronger and more resilient regional supply chains.

2.2 Mexico Room AC Market: Supply and Demand Analysis

In recent years, Mexico has emerged as a significant hub in the North American AC manufacturing landscape, leveraging its strategic advantages to develop a robust Heating, Ventilation, and Air Conditioning (HVAC) production sector. Mexico's advantages in terms of proximity to the US, lower labor costs and favorable tariff provisions under the United States-Mexico-Canada Agreement (USMCA) have allowed the development of a vibrant AC production base in Mexico and the maquiladora industry[3] that for decades has supported highly integrated supply chains for different products in the North American market. Transportation costs further enhance Mexico's competitive edge, with significantly lower shipping expenses to U.S. markets compared to Asian manufacturing centers, especially as global logistics costs have seen substantial increases since 2020.

Recent industry analysis confirms Mexico's expanding role in the regional HVAC market. Air conditioning unit sales in Mexico have grown at an average rate of 7% annually, surpassing one million units installed per year, driven by rising temperatures, accelerated urbanization, and growing awareness of environmental comfort (Rivera Mata, 2025). This growth trajectory exceeds the broader Latin American average and positions Mexico as one of the region's most dynamic cooling markets.

The substantial scale of foreign investment underscores Mexico's established position in HVAC manufacturing. Foreign direct investment (FDI) for the production of HVAC equipment in Mexico amounted to $8.3 billion between 1999-2024, with the majority coming from the U.S. ($7.3 billion), Japan ($535 million) and Germany ($212 million) (Rivera Mata, 2025). Mexico's Economic Census for 2019 indicates that 512 economic units were involved in the production of Industry and Commercial HVAC equipment, with the highest concentration in the states of Nuevo Leon (98), Jalisco (51) and Mexico City (47) (INEGI, 2019). The foreign direct investment data reported by the Economic Census underlines the high participation of companies like Carrier, Lennox, Trane, Johnson Controls, Daikin and LG Electronics in the sourcing of AC equipment in Mexico, which has become an AC production hub that supports exports to the U.S. and other international markets.

Despite Mexico's strong position in the broader HVAC manufacturing sector, the country remains highly dependent on imports for specific AC segments, particularly room air conditioners. As shown in Figure 3, China dominated Mexico's AC imports in 2021, accounting for 86% of total import value, while the United States, despite its significant involvement in Mexico's broader HVAC sector, represented only 13% of imports.

[3] A maquiladora is a foreign-owned factory in Mexico that imports duty-free materials, manufactures products, and exports them back to the owner's country (typically the U.S. or Canada). They leverage Mexico's lower labor costs while the foreign company provides expertise and strategic direction, with local management handling daily operations.

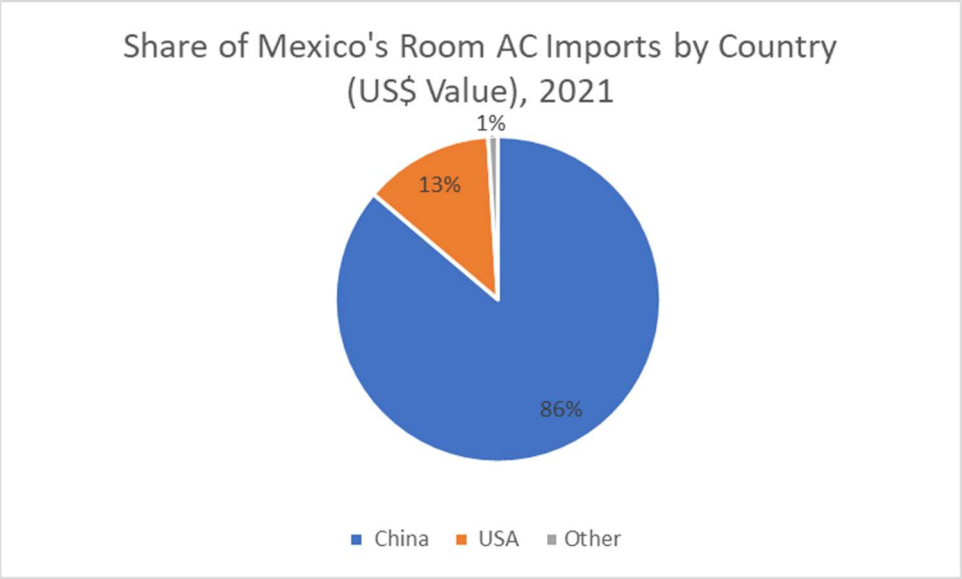

Figure 3 Share of Mexico's room AC imports by country (2021)

Source: UN COMTRADE database (includes The HS code 841510 covers air conditioning equipment including window units, wall-mounted units, ceiling-mounted units, floor-mounted units, self-contained units, and split systems, all equipped with a motor-driven fan and components for temperature and humidity control.

This trade pattern suggests a distinction between Mexico's role in different HVAC market segments - while the country has developed significant manufacturing capabilities in commercial and industrial HVAC equipment, it remains primarily an importer in the room AC segment, with a strong dependence on Chinese suppliers.

As shown in Figure 4, the Mexican mini-split AC market grew from approximately 700,000 units in 2020 (valued at around $300 million US) to nearly 900,000 units in 2021, with projections of steady growth through 2026 when the market is expected to exceed 1.1 million units with a value approaching $600 million US (BSRIA, 2022). Using 2021 as the starting point (as 2020 represents an abnormal baseline due to COVID-19 disruptions), this 2021-2026 trajectory yields a compound annual growth rate (CAGR) of 4.3%, which we apply to our market projections discussed later in the report.

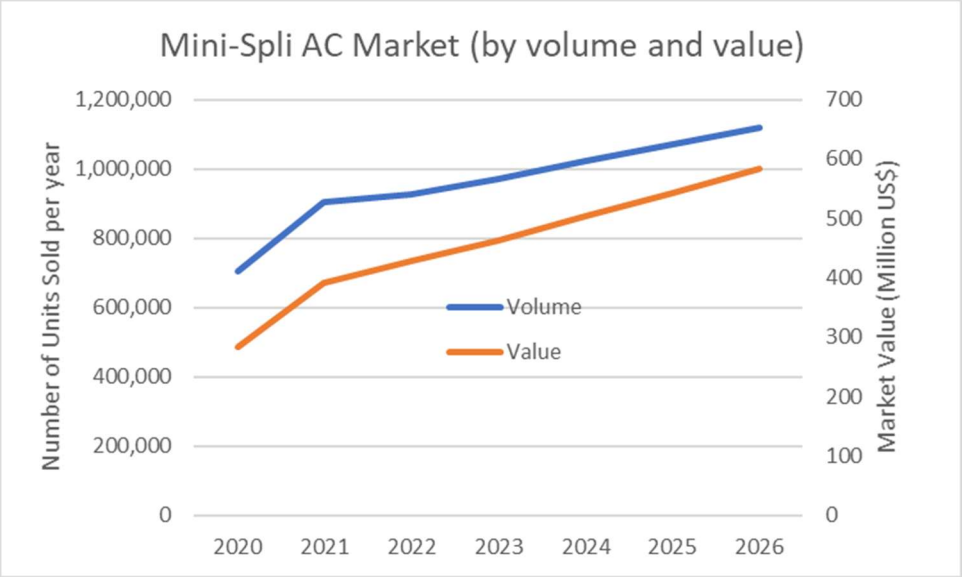

Figure 4 Mini-split AC Market and Future Outlook (BSRIA, 2022)

2.3 Energy Efficiency and Retail Price Analysis

The Mexican room air conditioning market presents a dynamic landscape of technological adoption and energy efficiency, operating within a structured regulatory framework. Mexico regulates air conditioner energy efficiency through two key standards: NOM-023-ENER-2018 for fixed-speed units and NOM-026-ENER-2015 for inverter units[4]. These standards establish minimum energy performance requirements (MEPS) using the Seasonal Energy Efficiency Ratio (SEER) metric, with different thresholds based on cooling capacity and technology type, with specific requirements detailed in the Annex II.

To comprehensively understand this market, a sophisticated data collection and analysis approach was developed in a past project (Chatellier et al. 2023). Leveraging web crawling technologies and the standards program certification database, this research provides unprecedented insights into the pricing, efficiency, and technological characteristics of mini-split air conditioners in Mexico.

The study employed an innovative two-stage data collection strategy:

[4] Air conditioning systems come in two main technological configurations: fixed-speed and inverter units. Fixed-speed units operate in a simple on/off cycle, running at full capacity until reaching the desired temperature and then shutting off completely. In contrast, inverter technology allows the system to operate at variable speeds, continuously adjusting its power output to maintain precise temperature control. This variable-speed operation typically results in 30-50% energy savings compared to conventional fixed-speed units.

- Web Scraping: Automated data extraction was conducted across four major online retailers (Walmart, Mercado Libre, Home Depot, and Linio) in January and August 2023. This approach systematically gathered critical market information including:
    - Product descriptions
    - Brand details
    - Model numbers
    - Retail prices
- Certification Validation: Collected model numbers were cross-referenced with the ANCE (Asociación Nacional de Normalización y Certificación del Sector Eléctrico) certification database. This crucial step allowed researchers to verify and enrich the dataset with certified energy performance data.

The methodology ensured a robust and comprehensive analysis of the Mexican air conditioning market, providing reliable, data-driven insights.

To evaluate the financial implications of efficiency improvements for consumers, a detailed price analysis was conducted based on categories that build upon Mexico's current MEPS (Annex II) across the three size categories and efficiency levels as defined below:

Size categories:

- **Small:** Cooling capacity lower than 4000 W, with a representative cooling capacity size of 1 Refrigeration Ton (RT).
- **Medium:** Cooling capacity between 4000 W and 6000 W, with a representative cooling capacity size of 1.5RT.
- **Large:** Cooling capacity greater than 6000 W, with a representative cooling capacity size of 2RT.

Efficiency levels:

- **Baseline :** Current MEPS for fixed speed SEER 3.4 W/W
- **Efficient:** Current MEPS for inverter SEER 4.7 W/W
- **High Efficiency:** Possible target SEER 5.7 W/W, roughly aligned with international best practices.

The regression analysis employed a multiple linear regression model using the 369 matched AC models to determine pricing relationships in the Mexican market. The model treated price as the dependent variable, with cooling capacity size and energy efficiency level as the primary independent variables. Through this regression, coefficients were estimated that quantify the price impact of each variable—specifically, how much additional cost is associated with moving from small to medium to large cooling capacities, and the price premiums for upgrading from baseline fixed-speed units to efficient inverter models or high-efficiency units (SEER > 5.7). These estimated coefficients were then used to calculate the predicted prices shown in Table 1 below:

Table 1 Mini-split Market Prices in Mexico Based on Regression Analysis (Chatellier et al. 2023)

EE level/Size	**Small**	**Medium**	**Large**
Number of models surveyed	188	100	81
Baseline	$418	$670	$906
Efficient	$622	$875	$1,111
High Efficiency	$810	$1,063	$1,299

The resulting price analysis shows the incremental cost for energy efficient units currently sold in Mexico, around $200 for efficient models and $400 for high efficiency models compared to baseline units. This demonstrates that Mexican consumers may be willing to pay a substantial premium for energy efficient units, confirming that there is a robust market for high-efficiency cooling equipment.

The retail price analysis will be instrumental in the next steps of the analysis to calibrate our bottom-up engineering estimates and understanding the complete price structure of air conditioners sold in Mexico, from factory gate products in China to retail point of sale.

3. Key industry players and manufacturing models

3.1 Key industry players

The Mexican HVAC market features a diverse ecosystem of manufacturers, distributors, and importers. Within this broader sector, the split system AC market—our focus in this analysis—comprises both international powerhouses and domestic players. As shown in Table 2, the market structure shows a clear division between companies that maintain manufacturing operations and those that operate primarily as importers (BSRIA, 2022). International manufacturers from Japan, South Korea, and China have established significant presence in the market, while several U.S. companies maintain strong positions primarily through import operations. Domestic Mexican companies like Mabe have also carved out important roles, though often relying on manufacturing partnerships in Asia.
The National Association of Appliance Manufacturers (ANFAD) plays a crucial role in this landscape, bringing together many of the sector's key players.

Table 2 Key Players in Mexico's Split System AC Market

Company	Role	Global HQ	Manufacturing Country	ANFAD Member
Carrier	Importer	USA	USA, China	Yes
Daikin	Manufacturer	Japan	Mexico, Japan, China	Yes
Gree	Manufacturer	China	China	No
Haier	Manufacturer	China	China	No
Hisense	Manufacturer	China	China	Yes
JCI	Importer	USA	USA, China	Yes
LG	Manufacturer	S. Korea	S. Korea, China	Yes
Mabe	Importer	Mexico	China	Yes
Mirage	Importer	Mexico	China	No
Panasonic	Manufacturer	Japan	Japan	Yes
Prime	Importer	Mexico	China	No
Samsung	Manufacturer	S. Korea	S. Korea, China, Argentina	Yes
Trane	Importer	USA	USA, China	No

*Note: Table 2 presents data adapted from the BSRIA report, with several corrections and updates based on LBNL's independent market research and verification

U.S. Manufacturers

It is important to note that while the mini-split market is dominated by Asian manufacturers, the broader HVAC manufacturing sector in Mexico includes significant U.S. involvement. U.S. HVAC manufacturers have substantial operations in Mexico, though these are primarily focused on larger commercial and industrial equipment rather than mini-split systems, which are produced almost exclusively by Asian manufacturers.
The depth of U.S. involvement in Mexico's HVAC manufacturing sector reflects a long-standing strategic partnership. Foreign direct investment for HVAC equipment production in Mexico reached $8.3 billion

between 1999-2024, with the overwhelming majority—$7.3 billion—originating from U.S. companies (Rivera Mata, 2025). This substantial investment underscores the established nature of US-Mexico manufacturing collaboration and validates the strategic rationale for further expanding this partnership in high-efficiency cooling technologies.

Several U.S. HVAC manufacturers have operations in the state of Nuevo León, Mexico, which has become an important manufacturing hub for the HVAC industry in the country. Companies such as Johnson Controls, Carrier, Lennox and Trane have a long-standing presence in the Mexican market, benefiting from its strategic location and workforce.

Trane, a leading HVAC manufacturer, has a significant presence in Mexico, including manufacturing, sales, service, and distribution operations. They have two manufacturing plants in Nuevo Leon, one in Apodaca and another in Monterrey. Trane also operates six sales offices, 18 service offices, and 8 parts centers across Mexico. Trane has expanded its manufacturing facility in Monterrey, adding 10,000 square meters for the production of residential-grade equipment for the U.S. market. This expansion, part of a broader nearshoring trend in Nuevo Leon, is expected to create more jobs and increase exports to the United States.

Carrier Corporation has important HVAC manufacturing operations in Mexico, primarily in the state of Nuevo León, with a main campus in Santa Catarina. These facilities are key to Carrier's global operations, producing a wide range of HVAC equipment.

In addition to Nuevo León, Lennox also has a manufacturing operation for HVAC products in Saltillo, Mexico, where Merit series air conditioners and heat pumps are produced.

Johnson Controls has several operations in Nuevo Leon, Mexico. They include a battery recycling center in Cienega de Flores, a manufacturing facility for refrigeration equipment in Monterrey, and a company called Johnson Controls Be Operations México, S. de R.L. de C.V. located in San Pedro Garza Garcia.

Key Non-US Manufacturers

Daikin

Daikin expanded its AC manufacturing capabilities in Mexico in 2024 with an investment of $230 million to open a production plant in the state of San Luis Potosi. The plant will manufacture inverter ACs (minis splits and Daikin FIT - Flexible Inverter Technology) for the residential market. The annual production capacity of the new facility is estimated at 2.7 million units (representing roughly a 20% market share of the Latin American market), will create 2,750 new jobs and is intended to replace AC units imported from Asia. A second production plan opened by Daikin last year will manufacture 4,500 chillers annually. In addition to the San Luis Potosi plants, Daikin is opening in 2025 a new manufacturing facility in Tijuana, Baja California, for the production of custom HVAC and computer-room air-handler products for data centers. The expansion of Daikin's AC manufacturing capacity in Mexico, which represents an investment of over $400 million in recent years, responds to a strategy to

address growing demand in the North American and Latin American markets, as stated by Daikin executives, who have indicated that the AC production localized in Mexico will complement the output of the Daikin Texas Technology Plant, currently the main Daikin operations and manufacturing center in the region[5].

Mabe

Mabe is as a prominent Mexican appliance manufacturer with extensive global reach, selling over 13 million appliance units annually across more than 70 countries. With a commanding 43% market share in Mexico's home appliances sector, Mabe's manufacturing network spans 18 plants worldwide[6]. The company's significance in the Mexican manufacturing sector was recently highlighted by its announcement of a $668 million investment to establish 15 new production facilities in Mexico between 2025 and 2027 (Eje Central, 2025).

While historically known for its kitchen and laundry appliances, Mabe has strategically expanded its air conditioning portfolio in recent years. In 2022, amid an impressive 40% overall sales growth compared to the previous year, Mabe announced a significant expansion of its AC equipment lineup. This expansion marked Mabe's entry into the commercial air conditioning market, complementing its existing residential mini-split AC offerings.

Mabe's recent investment strategy explicitly aims to strengthen its competitive position against Asian manufacturers who currently dominate global AC production. With Asian companies controlling over 96% of global room air conditioner manufacturing (Figure 1), Mabe's expansion represents a significant attempt to diversify the global AC supply chain. The company has specifically identified this investment as part of its strategy to compete against Asian companies while simultaneously strengthening its position in the U.S. market.

Mabe's approach to air conditioning technology benefits from its longstanding strategic alliances. The company's 1987 partnership with GE (which acquired 48% of Mabe) facilitated technological exchange and market access. This relationship evolved in 2016 when Chinese appliance giant Haier purchased GE Appliances for approximately $5 billion, creating a complex international partnership. Notably, financial sources indicate Haier attempted to acquire Mabe in 2019 to strengthen its Latin American presence, though this acquisition was ultimately not completed.

Mabe's manufacturing strategy positions it as a regional production powerhouse. The company's Manizales, Colombia plant serves as a key supply hub for South American markets, with 55% of its production exported to Chile, Ecuador, Peru, and Central America. This regional manufacturing approach—producing 3,800 refrigerators daily —offers insights into how Mabe might structure its

[5] More information: https://mexico-now.com/daikin-to-build-two-new-plants-in-slp/
https://www.mundohvacr.com/2022/08/daikin-construira-nueva-planta-de-fabricacion-hvac-en-mexico/
https://daikin.com.mx/noticia
https://www.achrnews.com/articles/154553-daikin-applied-plans-new-factory-in-tijuana-mexico

[6] MABE. ¿Quiénes somos? Retrieved from: https://mabeglobal.com/es_MX/quienessomos

expanding AC production to serve North and Latin American markets while reducing dependence on Asian imports.

Mabe's commitment to expanding domestic production through Mexico's current administration's "Plan Mexico" initiative suggests the company views air conditioning as a strategic growth category. Despite uncertainties regarding potential U.S. tariffs on Mexican imports, Secretary of Economy Marcelo Ebrard has confirmed Mabe's investment plans will proceed, indicating confidence in the company's ability to strengthen its position in the AC market despite potential trade challenges.

3.2 AC Manufacturing Models

Global AC manufacturers have adopted standardized production approaches to manage increasing market pressures and regulatory requirements. To minimize manufacturing costs, companies typically standardize their room AC designs and share components across various models in their product lines (Shah et al., 2021).

China's dominance in room AC exports is characterized by a predominantly ODM (Original Design Manufacturing) model. This structure has important implications for the equipment energy efficiency, as Chinese manufacturers can only make recommendations while ultimate efficiency requirements are determined by their customers. To understand this dynamic, it's helpful to examine the three main manufacturing approaches in the industry:

Original Equipment Manufacturing (OEM) represents the most basic model, where manufacturers simply produce according to customer specifications. In this arrangement, purchasers—typically value-added resellers or client companies operating in B2B relationships—control all major decisions including design, pricing, and product requirements such as energy efficiency and refrigerant choices. These purchasers buy the components or products manufactured by the OEM and then either integrate them into their own final products or rebrand them under their own private label before selling to the end consumer.

Original Design Manufacturing (ODM) offers manufacturers more involvement in the design process, though purchasers still maintain control over pricing and final product requirements. While ODM manufacturers can suggest energy efficiency improvements, the ultimate decisions rest with their customers.

Original Brand Manufacturing (OBM) represents the highest level of manufacturer control, typically employed by top brands. In this model, manufacturers have full authority over design, pricing, and product specifications including energy efficiency standards. This approach is most common among leading manufacturers who market products under their own brands.

This manufacturing framework has significant implications for advancing energy efficiency in the AC industry. Since Chinese exports are primarily ODM-based, improvements in energy efficiency specification often depend more on international purchaser requirements than manufacturer capabilities (according to unpublished data from ChinaIOL, 2022). This highlights the importance of

market demand in driving energy efficiency improvements in the global AC supply chain.

These manufacturing models—OEM, ODM, and OBM—are fundamental to understanding Mexico's role in the AC supply chain, particularly as nearshoring accelerates production for the North American market. The framework clarifies who controls critical decisions around design and energy efficiency specifications in Mexican operations. The following table summarizes the different manufacturing models in the AC industry. The following table summarizes the different manufacturing models in the AC industry.

Table 3 Manufacturing Models and Energy Efficiency Decision-Making in the AC Industry (ChinaIOL, 2022)

Manufacturing Types	**OEM**	**ODM**	**OBM**
Full Name	Original Equipment Manufacturing	Original Design Manufacturing	Original Brand Manufacturing
Manufacturing Stage	Manufacturer		
Design Stage	Purchaser	Manufacturer	
Pricing Rights	Purchaser		Manufacturer
Decision on Requirements (product category, energy efficiency, refrigerant, etc.)	Purchaser		Manufacturer

4. Technology assessment and High-Value Component Opportunities for U.S. Manufacturing

4.1 Transition to inverter technology

While most regions in the world have advanced in their transition to inverter technology (JRAIA, 2023), Mexico is lagging behind, with only 44% market share of mini-split inverter units (BSRIA, 2022). Developed markets like Japan, Oceania, China, Europe, and North America show near-complete adoption with 90-100% market share, while Mexico's adoption rate surpasses only the Middle East's 18% penetration.

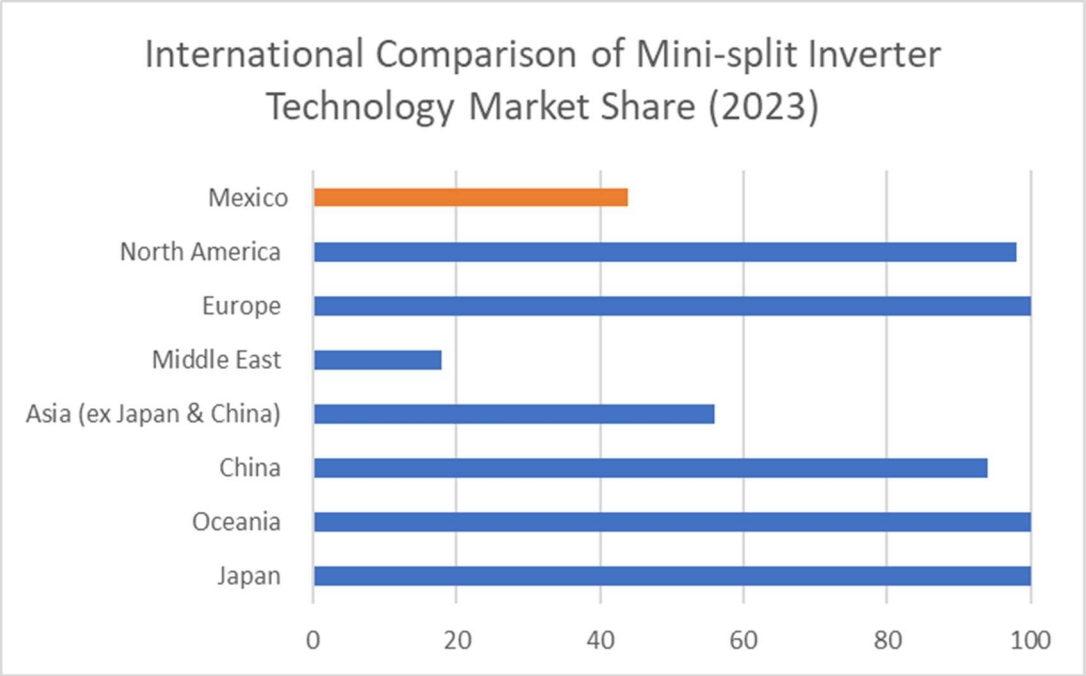

Figure 5 International comparison of Mini-split inverter Technology Market Share (2023)

The slow adoption of inverter technology in Mexico is particularly notable given global trends. Research shows that advanced inverter models can be two to three times more efficient than typical fixed-speed units sold in most markets (Karali et al., 2020). However, despite clear evidence of energy savings potential, Mexico's transition to this more efficient technology has been gradual, suggesting opportunities for interventions to accelerate adoption.

4.2 Key components suitable for U.S. manufacturing

Our analysis identifies several high-value mini-split components that present significant opportunities for U.S. manufacturers. These opportunities leverage U.S. strengths in advanced control systems, power electronics, software development, and system integration expertise.

The intelligence behind modern mini-split systems represents perhaps the most significant value-creation opportunity for U.S. manufacturers. Modern variable-speed systems require sophisticated

power electronics, control boards, and inverter components—precisely the semiconductor technologies targeted by the CHIPS Act. The establishment of the U.S. Investment Accelerator in 2025 to administer the CHIPS Act program[7] will support domestic production of these essential electronic components by reducing regulatory burdens and accelerating permitting processes.

What differentiates the U.S. approach is recognition that HVAC control systems exist within a broader electronics ecosystem. The crossover between HVAC controls and other high-tech sectors—including AI, consumer electronics, and renewable energy systems—creates additional scale advantages for manufacturers of control boards, power semiconductors, and smart integration technologies.

Table 4: U.S. Competitive Advantages in Advanced HVAC Controls and Electronics

Component Category	Key U.S. Players	Competitive Advantages	U.S. Capabilities	Market Opportunities
Control Boards and Hardware	Johnson Controls, Honeywell, Carrier Global	Multiple control boards for comprehensive system management	Production facilities in Wisconsin, Minnesota, Indiana, North Carolina	Smart building market growth, system upgrades, nearshoring opportunities
Control Software & Algorithms	Johnson Controls, Honeywell, Carrier Global	Sophisticated algorithms for temperature, humidity, occupancy detection	Software engineering and data science expertise	AI-enabled controls command premium pricing; data analytics services
Power Electronics & Inverters	Infineon (U.S. operations), Texas Instruments, ON Semiconductor, Microchip Technology	Power electronics and inverter control expertise critical for variable-speed systems	CHIPS Act-supported semiconductor fabrication; embedded systems design	High-skilled positions in power electronics and inverter systems; reduced Asian dependency
Smart Home & Grid Integration	Google Nest, Amazon, Apple, Microsoft	Cloud computing, edge processing, machine learning; demand response and flexibility capabilities	Crossover expertise from consumer electronics	Demand flexibility services; smart home ecosystem expansion

[7] Trump Executive Order on Investment Accelerator, March 31, 2025
https://www.whitehouse.gov/presidential-actions/2025/03/establishing-the-united-states-investment-accelerator/

The true U.S. advantage lies in sophisticated software-driven control systems and grid integration capabilities[8]. These elements enable premium positioning, higher margins opportunities, and create high-wage opportunities in engineering and data science fields, while control hardware serves as the delivery mechanism for this intellectual property.

4.3 Refrigerant Transition Opportunities

The global transition to advanced refrigerants presents a strategic opportunity for North American manufacturers to leverage their technological leadership in precision engineering and advanced safety systems to establish production of next-generation mini-splits in Mexico, serving the growing Latin American market for advanced refrigerant cooling systems. As Mexico implements its HFC phase-down commitments under the Kigali Amendment—freezing consumption by 2024 and achieving 80% reduction by 2045 (UNEP, 2016) —the shift away from R410A creates immediate demand for a new generation of sophisticated components and systems.

Currently, most mini-split ACs in the Mexican market use R410A refrigerant (BSRIA, 2022). However, advanced refrigerants alternatives are rapidly emerging as replacements. R32, already gaining global market share, offers significantly reduced environmental impact with a Global Warming Potential (GWP) of approximately 675—one-third that of R410A—while delivering improved energy efficiency. Major manufacturers including Daikin, Mirage, and Midea have already introduced R32 models in Mexico, signaling the transition's momentum. R290 (propane), with an ultra-low GWP of approximately 3, represents the lowest climate impact option, though adoption has been slower due to its flammability characteristics and associated safety requirements (Danfoss, 2025).

While Japan has led R32 deployment and safety testing, and European standards have driven aggressive charge limits for flammable refrigerants under IEC 60335-2-40[9], U.S. manufacturers can leverage their strengths in safety systems and controls integration to capture manufacturing opportunities in Mexico. The transition to alternatives like R32 and R290 requires precisely the type of advanced engineering capabilities where U.S. manufacturers excel:

1. **Safety System Leadership**: The adoption of mildly flammable (A2L) refrigerants like R32 and highly flammable (A3) refrigerants like R290 necessitates sophisticated safety components—leak detection systems, emergency shutoffs, and certified electrical components designed for flammable environments. U.S. manufacturers have established expertise in developing these safety-critical systems that meet stringent international standards.
2. **Advanced Control Technology**: As noted in industry analysis, the refrigerant transition requires "sophisticated control and safety systems" that integrate seamlessly with new refrigerant properties. This aligns directly with U.S. strengths in electronics, sensors, and software development—areas where American companies maintain technological leadership.
3. **Precision Component Manufacturing**: The shift to alternative refrigerants demands redesigned compressors, optimized heat exchangers, and specialized valves engineered for different

[8] For example, leading manufacturers, such as Carrier (Infinity Series) and Trane (XV20i), offer variable-speed units designed for grid connectivity.

[9] IEC 60335-2-40:2024, Household and similar electrical appliances - Safety - Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers, Edition 8.0, International Electrotechnical Commission, 2024.

thermodynamic properties. U.S. manufacturers can leverage their precision manufacturing capabilities to produce these high-value, technically complex components.

4. **Standards and Certification Expertise**: U.S. companies benefit from deep experience with evolving safety standards and can help Mexican manufacturers navigate the complex regulatory landscape surrounding flammable refrigerants.

This transition creates a window where U.S. technological leadership in safety systems, precision manufacturing, and advanced controls directly addresses Mexico's emerging market needs, positioning American suppliers as essential partners in Mexico's refrigerant transition.

5. Component and Cost Structure Analysis

The economics of cooling technology manufacturing in North America hinge critically on focusing production efforts where American manufacturers can leverage their competitive advantages: high-efficiency systems that command premium pricing through superior performance and intellectual property. While basic air conditioning units compete primarily on cost, high-efficiency models represent a strategic opportunity for U.S. manufacturers to capture value through advanced engineering, proprietary technologies, and performance differentiation.

The component cost structure analysis reveals that while labor-intensive assembly operations may favor lower-cost production regions, the high-value components that drive efficiency gains—advanced compressors, intelligent control systems, IoT-enabled sensors, and proprietary refrigerant management technologies—represent areas where American manufacturers can maintain competitive advantages through superior engineering and established intellectual property portfolios.

Furthermore, the shift toward regional production creates opportunities to optimize distribution channels and reduce supply chain complexities that have historically favored distant manufacturing locations. By analyzing the complete cost structure from component sourcing through final delivery, this section demonstrates how focusing on high-efficiency models enables North American manufacturers to compete effectively while delivering superior value propositions to customers seeking both performance and reliability in critical cooling applications.

5.1 Baseline Unit Cost Analysis

This analysis examines the manufacturing cost structure for baseline 1.0 RT (3.5 kW) mini-split AC units with the following specifications:

- Cooling capacity: 1.0 RT (3.5 kW)
- Fixed-speed drive technology
- Energy Efficiency Ratio (EER): 3.2 W/W, which is roughly equivalent to the current MEPS for fixed speed in Mexico (SEER 3.4 W/W) – See Annex II
- R410A refrigerant
- Basic feature set without premium additions

The total manufacturing cost for the baseline unit is estimated at $171.

These cost estimates were derived from the LBNL Global Cooling Program's manufacturer survey, which was designed to understand critical applications, challenges, and cost drivers in residential air conditioner manufacturing and the global AC supply chain (Shah et al., 2025). The survey targeted mini-split ACs/heat pumps with cooling capacity ≤5.3kW (1.5RT) and comprised four sections: (A) Company information, (B) General information, (C) Design and cost-related information, and (D) Other cost-related information. We received 11 valid responses from medium and large component and AC system manufacturers, many of whom serve as global OEMs and suppliers.

The baseline cost data was also informed by the team's previous research experience and engineering estimation, drawing from prior LBNL AC design projects and industry knowledge (Ding et al., 2026). Cost figures are reported in 2021 US$ and have been adjusted to 2022 US$ to align with market survey data (Table 1). These estimates reflect typical manufacturing costs for units produced by Chinese manufacturers who currently supply the vast majority of room air conditioner units sold in Mexico.

The breakdown by component for the baseline unit is as follows:

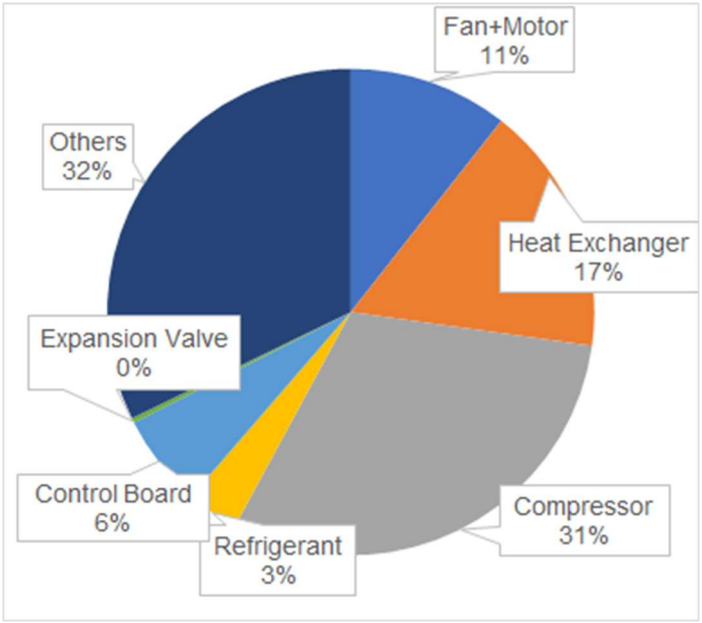

Figure 7 Baseline cost structure for mini-splits in Mexico (Total material cost 171 $US)

Notes: 1) *Estimates derived from questionnaires with key component and AC manufacturers in China, many serving as global OEMs and suppliers, but have not been validated by Mexican stakeholders*
2)*"Others" (32%)—the largest cost share—encompasses structural components, casing plastics, wiring, plumbing, insulation, and the hundreds of discrete parts beyond major functional components needed to assemble a complete mini-split unit.*

The total factory gate price can be further broken down into its key cost elements as shown in Table 6:

Table 5 Detailed Manufacturing Cost Breakdown for 1.0 RT Mini-Split AC (baseline)

	Cost (2022 US$)	Share (%)
Material	171	65%
Labor	18	7%
Overhead	6	2%
Depreciation	11	4%

Manufacturer markup	58	22%
Factory Gate price	264	**100%**

With a retail price of $418 as presented in Table 1 of this report, we calculate a total markup of 58% from the factory gate price of $264 to the final point of sale in Mexico. This markup encompasses all costs along the distribution channel, including transportation and logistics, distributor margins, retailer markups, and value-added taxes. It's important to note that Mexico does not apply import tariffs on imported air conditioners. This established 58% markup serves as the basis for estimating factory gate prices throughout the remainder of our analysis, allowing us to project costs for high-efficiency units across various AC sizes according to the market price findings presented in Table 1.

5.2 Efficient Unit Cost Analysis

For a higher efficiency air conditioner (SEER 4.7 and 5.7), we analyzed the cost structure maintaining the same markup as the baseline model to understand the true manufacturing cost implications of improved efficiency.

Component costs are determined using cost data for improved efficiency components presented in Annex III. As there are various design combinations to achieve 4.7 SEER performance, these costs represent one example of the material cost breakdown for high-efficiency mini-split systems that meet this standard.

Figure 6 reveals the cost structure for one design configuration of SEER 4.7 mini-splits produced in Mexico, with a total material cost of $254 US$. This particular design approach shows that four key components dominate manufacturing costs: the compressor (22%), control board electronics (21%), heat exchanger (13%), and fan motor assembly (11%). Together, these four critical components account for 67% of total material costs, representing the highest-value manufacturing opportunities for supply chain development. The remaining costs are distributed across refrigerant (2%), expansion valve (3%), and other miscellaneous components (28%).

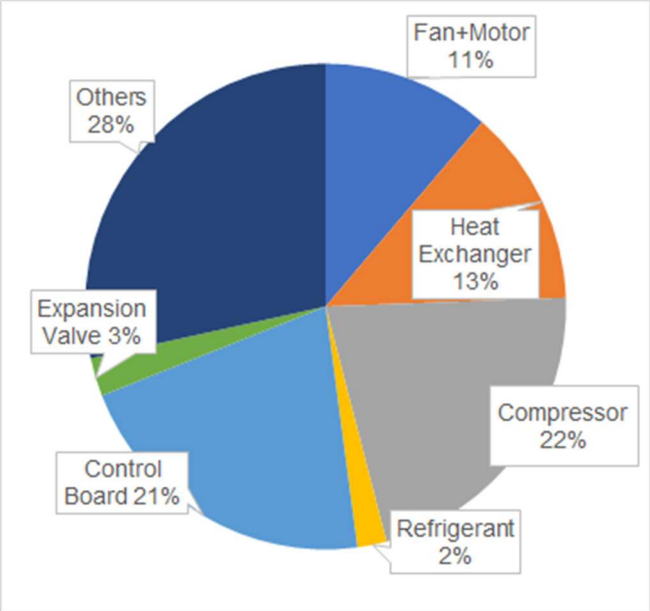

Figure 6 SEER 4.7 component cost structure for mini-splits in Mexico (Total material cost 254 $US)

Our analysis assumes constant cost shares across efficiency levels, meaning manufacturing cost components scale proportionally with overall unit cost. These cost shares, derived from the baseline unit shown in Table 6, are applied to calculate the manufacturing cost breakdown in Table 7 for a 1.0 RT mini-split AC achieving SEER 4.7 performance, with a factory gate price of $393. This approach reflects that efficiency improvements primarily drive material cost increases through upgraded components while manufacturing processes and business structures remain fundamentally unchanged[10].

[10] We maintain constant cost share percentages across all efficiency levels as a simplifying assumption. In practice, labor costs likely remain relatively stable across efficiency levels since assembly processes are standardized, which would increase material cost percentages for premium units. However, we lack detailed cost share data for high-efficiency units and apply baseline shares to avoid additional analytical uncertainties.

Table 6 Detailed Manufacturing Cost Breakdown for 1.0 RT Mini-Split AC (SEER 4.7)

	Cost (2022 US$)	Share (%)
Material	254	65%
Labor	27	7%
Overhead	10	2%
Depreciation	16	4%
Manufacturer markup	86	22%
Factory Gate price	**393**	**100%**

Similar cost distributions are observed for top-of-the-line AC systems, as shown in the comparison chart below. While alternative design configurations may emphasize different component combinations to achieve high efficiency ratings, the consistency in component cost ratios across different product tiers demonstrates that compressors, control boards, and heat exchangers typically remain the primary value drivers. This cost structure analysis identifies where manufacturing investments can capture the greatest economic value while building technical capabilities in Mexico's most strategically important AC components.

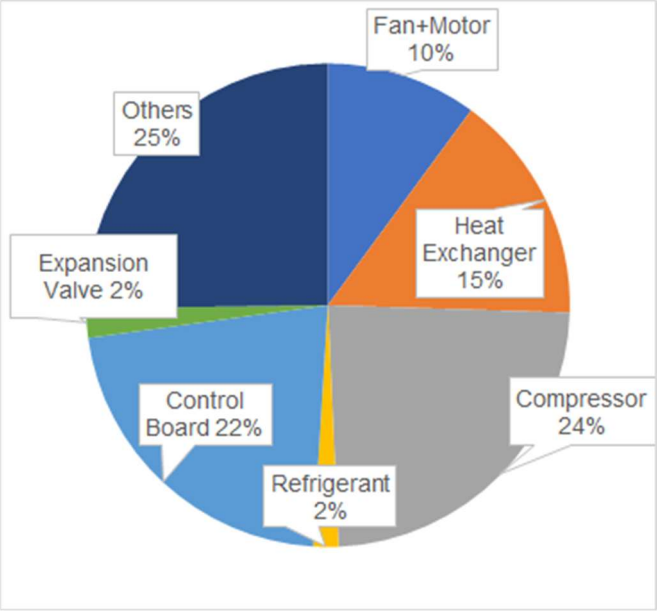

Figure 7 SEER 5.7 component cost structure for mini-splits in Mexico (Total material cost 331 $US)

Applying the same constant cost share assumptions to the higher-efficiency SEER 5.7 model, Table 8 shows a factory gate price of $511. This substantial cost escalation reflects the advanced technology requirements for achieving superior efficiency performance, with materials costs rising to $331 and manufacturer markup increasing to $112.

The enhanced efficiency requirements result in higher absolute costs across all components, creating proportionally larger opportunities for U.S. component manufacturers in advanced technologies such as variable-speed compressors, sophisticated control systems, and premium materials. While we maintain the same markup percentage across all efficiency levels, the higher manufacturing costs result in larger absolute markup values ($112 versus $86 for SEER 4.7), making higher-efficiency models particularly attractive targets for U.S.-Mexico manufacturing collaboration focused on technology-intensive, high-value components.

Table 7 Detailed Manufacturing Cost Breakdown for 1.0 RT Mini-Split AC (SEER 5.7)

	Cost (2022 US$)	Share (%)
Material	331	65%
Labor	35	7%
Overhead	12	2%
Depreciation	21	4%
Manufacturer markup	112	22%
Factory Gate price	**511**	**100%**

5.3 U.S. Manufacturer Opportunity Analysis (unit level)

The cost structure analysis reveals multiple strategic entry points for U.S. manufacturers to participate in Mexico-based air conditioning production, ranging from high-value component supply to leveraging substantial manufacturer margins through advanced capabilities and logistics advantages.

U.S. Component Manufacturing Opportunities: Prime opportunities exist for U.S. component suppliers, particularly in control boards, refrigerants, and advanced electronic systems. For premium models (SEER 4.7+), we assume that **25% of material costs** could come from U.S. manufacturers—specifically in advanced control hardware and software systems, electronics ecosystem integration and semiconductor investment, and refrigerant transition opportunities as described in Figures 6 and 7 of our report. These components benefit from U.S. strengths in semiconductor design, chemical industry expertise, and

regulatory compliance, while additional opportunities exist in variable-speed compressor technologies, advanced sensors, smart connectivity modules, and specialized heat exchanger materials.

Strategic Markup and Positioning: The substantial manufacturer markup (22% shown in our cost analysis) represents our estimate of the current market average, but demonstrates significant potential for strategic flexibility in value capture. During previous manufacturer interviews, we found that some manufacturers are pursuing alternative strategies with markups that can go up to 50%, indicating a high-margin, low-volume approach rather than competing purely on price. This strategic positioning creates opportunities for advanced manufacturing capabilities and technological innovation—areas where U.S. technical expertise can command premium pricing while supporting Mexico's role as a cost-effective manufacturing and assembly hub.

Logistical Advantages Creating Strategic Value: Additionally, because logistical costs may be reduced significantly, this creates additional "room" for manufacturers to capture benefits. A 53-foot container shipped from China to Los Angeles costs approximately $5,000, while the same container from the Mexico border region costs only about $600—representing an 88% cost reduction (NAPS International, 2025). Beyond direct cost savings, proximity enables 24- to 48-hour lead times compared to 3+ weeks for China-based production.

These manufacturing costs are based on current market prices and inferred markups found in the Mexican market, representing the competitive benchmark that must be met or exceeded. However, these logistical advantages create multiple value opportunities: manufacturers can capture higher margins while maintaining competitive pricing, pass savings to consumers to increase market penetration, or reinvest cost savings into higher-quality components and advanced technologies that further differentiate Mexico-manufactured units in the North American market.

Figures 8 and 9 illustrate the cost breakdown for 1 RT mini-split room ACs at both SEER 4.7 and 5.7 efficiency levels, with patterned areas highlighting specific opportunities for U.S. component manufacturers and AC manufacturers in Mexico.

U.S. component manufacturers can capture $63 per unit at SEER 4.7 and $83 per unit at SEER 5.7. If U.S. manufacturers also handle production in Mexico, total value capture would reach $149 per unit at SEER 4.7 ($63 materials + $86 markup) and $195 per unit at SEER 5.7 ($83 materials + $112 markup).

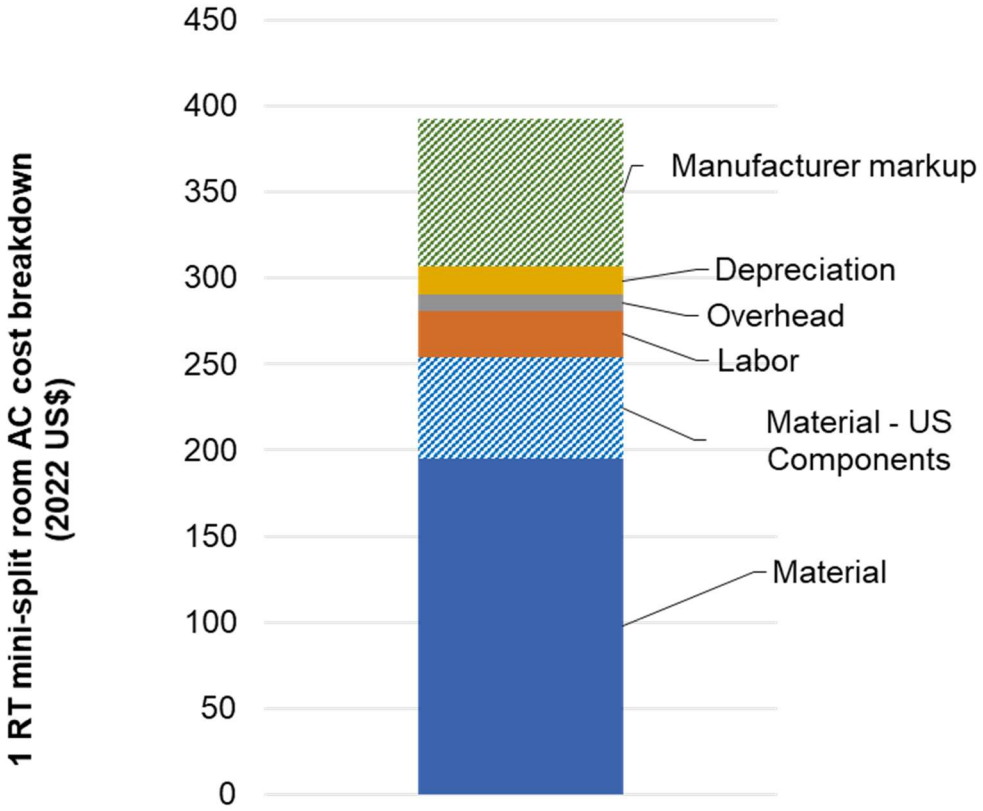

Figure 8 1 RT mini-split room AC cost breakdown and opportunities for U.S. Manufacturers (SEER 4.7)

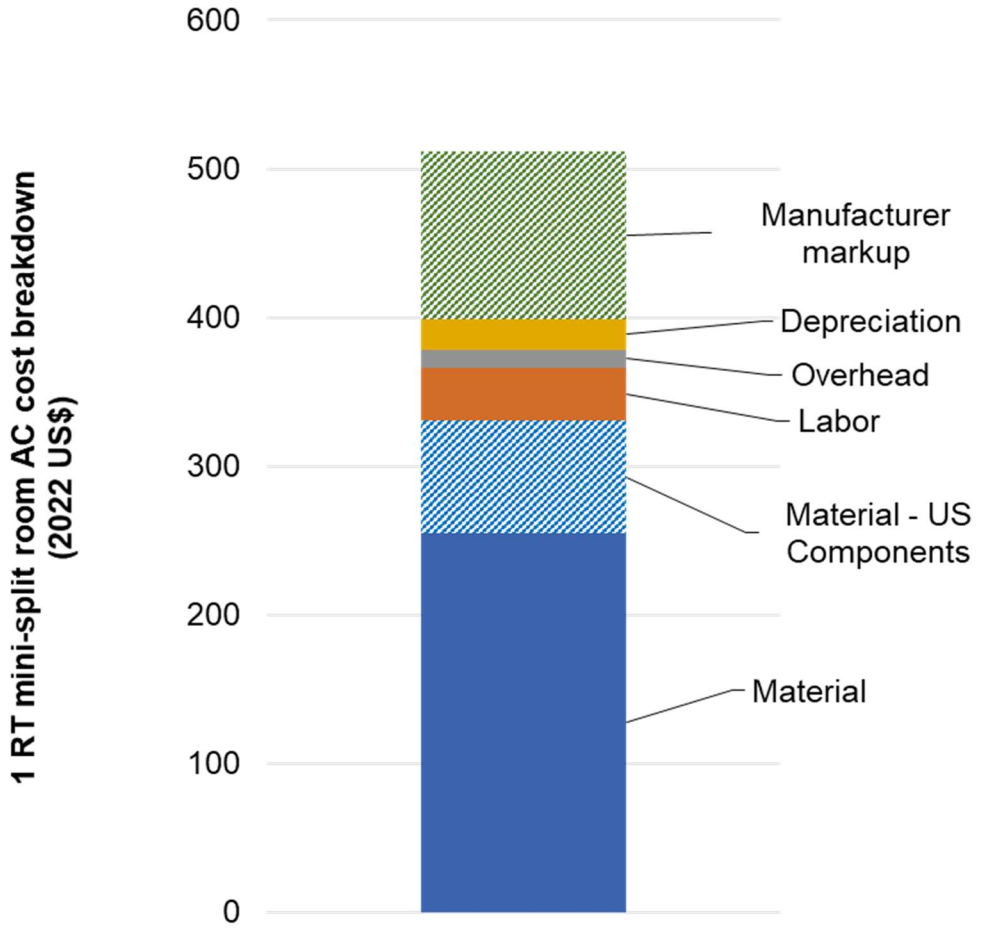

Figure 9 1 RT mini-split room AC cost breakdown and opportunities for U.S. Manufacturers (SEER5.7)

6 Market Opportunities and Economic Impact

Our analysis indicates that U.S. manufacturers producing key air conditioning components in both U.S. and Mexican facilities, with final assembly in Mexico, for the broader Latin American market could generate substantial economic benefits, driven by robust market growth and the premium pricing potential of high-efficiency technologies.

6.1 Scaling Cost Analysis Across AC Sizes

To extend our detailed cost analysis from the baseline 1.0 RT (small) unit to medium and large systems, we calculated scaling factors that capture the relationship between system size and factory gate prices using the retail price survey data presented earlier in the report (Table 1). To ensure representative cost projections, we calculated weighted averages based on the number of models surveyed in each cooling capacity category. Table 8 presents the revenue opportunities for U.S. manufacturers per AC unit for all categories, both for component manufacturers and AC manufacturers.

Table 8 Market Opportunities across all sizes of Mini-Split ACs

System Size	Efficiency Rating	U.S. Component Content*	AC Manufacturer Selling Price
Small	4.7 SEER	$63	$393
	5.7 SEER	$83	$511
Medium	4.7 SEER	$89	$552
	5.7 SEER	$108	$671
Large	4.7 SEER	$113	$777
	5.7 SEER	$133	$881
Average	4.7 SEER	$81	$520
	5.7 SEER	$101	$636

*Represents components manufactured in U.S. facilities (control boards, semiconductors, refrigerants, advanced sensors) and shipped to Mexico for final assembly

6.2 Revenue Potential for U.S. Manufacturers

The Latin American cooling market presents a compelling growth opportunity. Mexico's approximately 1 million annual AC sales represent a significant share of the region's 13 million unit market (2021 data), alongside Brazil's 4 million units and 8 million units across the remainder of Latin America. Based on available data, we project annual growth rates of 4.3% for Mexico and 4.7% for Brazil (Letschert et al., 2019).

While recent industry analysis indicates that air conditioning unit sales in Mexico have grown at an average rate of 7% annually, and the broader Latin American air conditioning market is estimated to have a compound growth rate of 6.5% annually (Rivera Mata, 2025), we maintain a conservative 4.5% annual growth assumption for our projections (which is about 2/3 of the industry estimates) to account for potential market volatility and economic uncertainties. This conservative approach ensures our

revenue projections represent achievable targets rather than optimistic scenarios, providing a more reliable foundation for investment decision-making.

This growth trajectory positions the total addressable market at 20 million units by 2030, representing a substantial opportunity for U.S. component manufacturers, as well as AC manufacturers.

Premium Component Market Sizing

Based on our cost structure analysis, high-value components suitable for U.S. manufacturing—including control boards, refrigerants, variable-speed compressors, and advanced sensors—represent approximately $81 per unit in SEER 4.7 systems and $101 per unit in SEER 5.7 systems.

We assume a 15% market share of total mini-split sales for premium systems, based on comparable market penetration rates observed among premium AC manufacturers investing in Mexico. By 2030, annual revenues from premium components are projected to reach $16-20 million in the Mexico market and $220-275 million across the broader Latin American market. This represents a significant opportunity for U.S. component suppliers to capture a meaningful portion of the regional premium component demand.

To contextualize this 15% market share assumption, Daikin's recent investment is particularly instructive. Having invested $230 million to establish a manufacturing plant in San Luis Potosí with an annual capacity of 2.7 million AC units, this represents the level of investment required to target approximately 15% market share in Latin America by 2030.

Mini-split ACs market sizing

Similarly, for AC manufacturers establishing high-efficiency mini-split production facilities in Mexico, the complete system revenue potential presents compelling market opportunities. Manufacturing costs for finished mini-split units—incorporating materials, labor, overhead, depreciation, and manufacturer markup—translate to factory gate prices of approximately $520 for SEER 4.7 systems and $636 for SEER 5.7 systems.

Assuming a 15% market share of total mini-split sales (as discussed in the Premium Component Market Sizing section above), by 2030 annual revenues from complete system manufacturing are projected to reach $106-129 million in the Mexico market and $1.4-1.7 billion across the broader Latin American market. This represents a substantial opportunity for U.S. manufacturers to leverage nearshore production advantages while capturing a meaningful portion of the region's expanding premium air conditioning demand.

To put these revenue numbers in perspective, the Daikin example is particularly useful. Having invested $230 million to establish a manufacturing plant in San Luis Potosí with an annual capacity of 2.7 million AC units, this represents the level of investment required to target approximately 15% market share in Latin America by 2030.

Given that manufacturer markups are estimated around 22% of factory gate prices, this should provide sufficient room for profitability on projected revenues of $1.4-1.7 billion across the Latin American market. However, these investment economics and margin assumptions would need to be validated through detailed discussions with U.S. manufacturers to confirm feasibility and return requirements for

market entry decisions.

6.3 Supply Chain Resilience Benefits

Reduced Dependency on Asian Imports

Current AC manufacturing relies heavily on Asian supply chains, creating vulnerabilities from geopolitical tensions, shipping disruptions, and quality control challenges. U.S. component manufacturing for Mexico-assembled units reduces these dependencies while maintaining cost competitiveness. The 88% reduction in shipping costs ($5,000 vs. $600 per container) and dramatic improvements in lead times (3+ weeks vs. 24-48 hours) create immediate operational advantages.

Improved Response to Market Demands

Proximity manufacturing enables rapid response to market changes, seasonal demand fluctuations, and emerging technology requirements. This agility is particularly valuable in the evolving AC market, where efficiency standards, refrigerant regulations, and smart technology integration create ongoing adaptation requirements. U.S. manufacturers can leverage this responsiveness to capture market share and command premium pricing for cutting-edge technologies.

6.4 Economic and Employment Impacts

Job Creation Potential

Using the Daikin San Luis Potosí plant benchmark of 2,750 jobs for a facility with 2.7 million units of annual production capacity, U.S. manufacturers establishing similar production lines would create substantial employment opportunities across both countries.

For U.S. operations, facilities would generate high-skill manufacturing jobs concentrated in advanced control boards and hardware components, AI-enabled control algorithms and software development, semiconductor integration, and proprietary system technologies. These positions typically offer wages above U.S. manufacturing averages due to the technical complexity and intellectual property intensity of modern HVAC systems.

In Mexico, production facilities would generate direct manufacturing jobs focused on assembly, logistics, and operational roles. The combined US-Mexico employment impact creates a complementary workforce structure that leverages each country's competitive advantages.

The multiplier effect of advanced manufacturing creates additional indirect employment in supporting industries, logistics, and professional services. Using employment multipliers for household appliance manufacturing, each direct manufacturing job supports an additional 2.66 positions in the broader economy (Bivens 2019). This suggests total employment impacts of approximately 10,000 jobs (2,750 direct jobs × 3.66 total multiplier) from a single 2.7-million-unit production line. This distributed job creation model strengthens the economic case for nearshore manufacturing while supporting high-value employment in U.S. facilities focused on advanced controls, semiconductors, and proprietary technologies.

Regional Economic Benefits

Beyond direct employment, U.S. component manufacturing for Mexico creates broader economic benefits including increased exports, enhanced manufacturing capabilities, and strengthened North American supply chain integration. By focusing on high-value components where U.S. firms maintain advantages in IP, advanced controls, and systems integration, American manufacturers can compete globally in premium markets while building expertise in emerging cooling technologies.

The collaborative approach with Mexico creates shared economic benefits, with U.S. technical expertise and component manufacturing complementing Mexico's cost-effective assembly and market access. This partnership model can serve as a template for broader reshoring initiatives that maintain competitiveness while building regional supply chain resilience.

7 Conclusion: Strategic Opportunities for U.S. Manufacturers

The current concentration of global air conditioning manufacturing in China, combined with Mexico's emerging role as a regional production hub, presents U.S. manufacturers with a critical opportunity to diversify supply chains while capturing significant market share in high-growth Latin American markets.

Energy Security and Grid Resilience Benefits
Mexico's electrical grid faces mounting challenges as cooling demand drives peak load increases projected to reach 26 GW by 2050. High-efficiency air conditioning systems directly address this infrastructure crisis by reducing peak electricity demand through superior energy performance ratios. While baseline fixed-speed units achieving SEER 3.4 place maximum stress on electrical systems during peak hours, advanced inverter units with SEER 4.7-5.7 ratings can reduce individual unit electricity consumption by 30-50% precisely when grid stability is most critical.

This demand reduction has cascading benefits for energy security. Lower peak loads reduce Mexico's reliance on expensive peaking power plants, decrease the need for electricity imports during high-demand periods, lower electricity bills for consumers and businesses, and create grid stability that supports broader economic development. By reducing peak load, high-efficiency cooling also supports reliable baseload generation, complementing investments in firm power resources such as nuclear and geothermal energy.

Strategic Manufacturing Integration
This strategic pivot toward regional manufacturing aligns with broader supply chain diversification trends, as recent analysis indicates that U.S. manufacturers shifting production from China could cut operating costs by an additional 23% through nearshoring to Mexico (PwC, 2020). Mexico's recent tariff measures targeting imports from countries without trade agreements create additional incentives for establishing regional manufacturing capacity. An ongoing USMCA review emphasizing substantially higher U.S.-manufactured content in key sectors further reinforces this favorable policy environment. The regulatory environment increasingly supports regional integration, as evidenced by the recent AHRI-CSA harmonization agreement that will create unified standards across U.S. and Canadian markets[11], further reducing barriers to North American manufacturing collaboration.

U.S. manufacturers can capitalize on this opportunity by focusing on high-value components where American technological leadership translates into sustainable competitive advantages. Advanced control hardware and software systems, power semiconductors and inverter components, smart grid integration technologies, and sophisticated refrigerant management and safety systems represent areas where U.S. intellectual property and manufacturing expertise command premium pricing while Mexican assembly operations provide cost-effective production and market access.

Supply Chain Resilience and National Security
Current global air conditioning manufacturing concentration creates profound vulnerabilities, with China controlling 82% of production and up to 90% of critical components. Recent Chinese restrictions on

[11] Air-Conditioning, Heating, and Refrigeration Institute (AHRI), "AHRI and Canadian Standards Association sign binational harmonization agreement for joint standards development," LinkedIn, September 2025, https://www.linkedin.com/posts/the-air-conditioning-heating-and-refrigeration-institute_were-proud-to-announce-that-ahri-and-the-activity-7370780511947948033-EGxb/

exporting gallium, germanium, and rare earth elements essential for high-efficiency systems underscore the strategic importance of developing alternative supply sources. The CHIPS Act investments in domestic semiconductor production directly address these vulnerabilities by enabling U.S. manufacturers to produce the advanced control electronics that differentiate high-efficiency systems from commodity products.

Economic Impact and Market Potential

The Latin American cooling market, projected to reach 20 million units annually by 2030, represents substantial revenue opportunities. Conservative projections indicate that U.S. component manufacturers could capture $220-275 million in annual premium component revenues across the region, while complete system manufacturing could generate $1.4-1.7 billion in factory gate revenues for companies. These findings support potential U.S. manufacturing strategies with minimum U.S.-manufactured content requirements, consistent with current North American manufacturing and trade priorities.

Strategic Implementation Path

Success requires coordinated action across multiple dimensions: leveraging CHIPS Act semiconductor investments to produce advanced control systems, establishing strategic partnerships with Mexican manufacturers who can provide cost-effective assembly, and focusing initial market entry on high-efficiency segments where technological differentiation supports premium pricing.

The ultimate vision encompasses a resilient, integrated North American HVAC ecosystem where U.S. technological expertise combines with Mexico's manufacturing capabilities to serve regional and global markets while strengthening energy security, reducing peak demand pressures, and creating high-value employment opportunities across both countries. This transformation of air conditioning from a commodity business into a technology-driven industry that supports grid modernization and energy independence represents both a strategic imperative and a substantial commercial opportunity.

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Annexes

Annex I Full list of AC suppliers in Mexico according to ANCE certification database (obtained in 2022)

ACAPULCO KONGTIAO
ARCTIC KING
AUFIT
AURUS
AUX
B AIR, B-AIR, BAIR
BENELUX
BOCELI
CARRIER
CIAC
COMFEE
COMFORTSTAR
COMFRICAL
DAEWOO
DAIKIN
DRUMMOND
DUVENTUS
EVANS
EXTENSSA
FREYVEN
FRIKKO, AIRON, MAGIC AIR,FROZEN
GREE
GYATEK
HAIER
HIGH PRESTIGE
HISENSE
INTENSITY
IUSA
JAPANDO
KALLEY
LANIX
LENNOX
LG
MABE, IO MABE
MIDEA
MIRAGE
MITSUBISHI ELECTRIC
NEOAIRE
PANASONIC
PRIME
RHEEM
RUUD
SAMSUNG
SKY GREEN
TCL
TERSUS
TRAIDEN AIR
TRANE
UA UNITED APPLIANCES
WHIRLPOOL
WHITE-WESTINGHOUSE
WYNN TECHNOLOGY
YORK
ZMARTECH

Annex II Mini-split ACs Energy Efficiency Standards in Mexico

Mexico regulates air conditioner energy efficiency through two key standards: NOM-023-ENER-2018 for fixed-speed units and NOM-026-ENER-2015 for inverter units[12]. These standards establish minimum energy performance requirements (MEPS) using the Seasonal Energy Efficiency Ratio (SEER) metric, with different thresholds based on cooling capacity and technology type.

Table A-II Current MEPS for mini-split ACs in Mexico

Cooling Capacity (W)	Fixed Speed SEER (W/W) NOM-023-ENER-2018	Inverter SEER (W/W) NOM-026-ENER-2015
Up to 4,101	3.37	4.68
Between 4,101 and 5,859	3.37	4.68
Between 5,859 and 10,600	3.31	4.39
Between 10,600 and 19,050	3.28	4.10

[12] Air conditioning systems come in two main technological configurations: fixed-speed and inverter units. Fixed-speed units operate in a simple on/off cycle, running at full capacity until reaching the desired temperature and then shutting off completely. In contrast, inverter technology allows the system to operate at variable speeds, continuously adjusting its power output to maintain precise temperature control. This variable-speed operation typically results in 30-50% energy savings compared to conventional fixed-speed units.

Annex III Options to further improve efficiency of ACs with associated costs

Option	Component	Incremental Manufacturing Cost (US$)	Energy Savings from Baseline
Compressor[1]			
Compressor 1	3.4 EER Compressor	2.2	5%
Compressor 2	3.6 EER Compressor	15.4	10%
Inverter/Variable Speed			
Inverter AC	Alternating Current (AC) compressor with variable speed drive	38.4	21.0%
Inverter DC	Direct Current (DC) compressor with variable speed drive	50.0	23.0%
All DC	Variable speed drives for fans and compressor	61.0	26.0%
Heat Exchanger			
Heat Exchanger 1	UA[2] of both HEs increased by 20%	2.4	7.5%
Heat Exchanger 2	UA of both HEs increased by 40%	4.7	13.5%
Heat Exchanger 3	UA of both HEs increased by 60%	7.1	17.5%
Heat Exchanger 4	UA of both HEs increased by 80%	9.4	21.0%
Heat Exchanger 5	UA of both HEs increased by 100%	14.7	24.0%
Expansion Valve			
TXV	Thermostatic Expansion Valve	3.7	5.0%
EXV	Electronic Expansion Valve	10.3	9.0%

(1) Baseline compressor has 3.2 EER. (2) UA represents the product of overall heat exchange coefficient (U) and heat exchanger area (A).