

Building Codes as a Catalyst: Scaling Up R290 Split ACs

Opportunities, Challenges, and the Path Forward

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Why Building Codes Matter for Refrigerant Transition



Building codes are the structural interface between refrigerant safety standards and real-world AC deployment — the missing link in the R290 scale-up chain.

International Standards

IEC 60335-2-40 | ASHRAE 15-2024 | EN 378

National Building Codes

Safety / Fire Codes | Energy Codes | Green Building Codes

Market Deployment

R290 Split AC Installations in Buildings

The Bottleneck

Without code alignment, even certified R290 equipment cannot be legally installed in many jurisdictions. One code update can unlock an entire national market — that is the leverage point.

The Current Standards Landscape — Progress and Gaps



Standard / Region	Key Provision	R290 Status	Implication
IEC 60335-2-40 (2022/2024)	Room-area-based charge formula replaces 150g blanket limit	✓ Enabled	<i>Practical split AC charges now permitted</i>
EU F-Gas Regulation	Phase-down of high-GWP HFCs; GWP limits for new equipment	✓ Enabled	<i>R290 effectively the compliant option in key categories</i>
ASHRAE 15-2024 (USA)	A3 refrigerants limited to <150g in residential/commercial	⚠ Restricted	<i>Most split AC applications non-compliant; harmonization pending</i>
Most Developing Countries	Pre-2022 150g limit or no specific A3 provisions	✗ Blocked / Grey Zone	<i>Legal uncertainty prevents market development</i>

Key Finding: The same R290 unit is legal in Germany, but sits in a regulatory grey zone in dozens of high-growth markets across Asia, Africa, and Latin America.

How Building Codes Can Facilitate R290 Scale-Up



01

Safety Code Alignment

Adopt IEC 60335-2-40 (2022/2024) room-area charge formula. Replace blanket 150g limit. Mandate leak detection for larger charges.

02

Energy Codes & MEPS

Set SEER/EER efficiency tiers that R290 can meet but older HFC equipment cannot. Use MEPS as a de facto technology driver.

03

GWP Limits in Building Permits

Require GWP < 10 for refrigerants in new construction and major retrofits — as California Title 24 and EU F-Gas are beginning to mandate.

04

Green Building Rating Integration

Embed R290/natural refrigerant credits in LEED, BREEAM, and national green building schemes. Make low-GWP refrigerants a prerequisite for top ratings.

Case Study — EU and Germany as a Model for Policy Coherence



Policy Timeline

2006	EU F-Gas Regulation introduced — first GWP limits
2014	F-Gas Regulation revised — phase-down schedule tightened
2019	Blue Angel eco-label for R290 ACs established in Germany
2022	EU F-Gas Regulation revision — R290 effectively required for split ACs
2024	IEC 60335-2-40 updated — higher charges enabled across EU
2026	Germany R290 market share >40%; Midea: 10M units sold globally

Outcomes

>40%

R290 market share in Germany

10M+

R290 AC units sold globally (Midea alone)

5.2 Mt

CO₂e avoided by Midea R290 units

Key Lesson: Policy coherence across safety, energy, and environmental codes is more powerful than any single regulation.

A Practical Roadmap — What Governments Should Do Now



Track 1

Standards Alignment

Year 1–2

Adopt IEC 60335-2-40 (2022/2024) charge limits

Align national fire codes with actual R290 risk profile

Fast-track approval for certified R290 equipment

Establish inter-ministerial coordination mechanism

Track 2

Code Integration

Year 2–3

Embed GWP thresholds in building energy codes

Link MEPS updates to R290 efficiency advantages

Require low-GWP refrigerants in public buildings

Integrate into green building rating systems

Track 3

Capacity & Finance

Year 1–5

Mandate certified installer training as permit condition

Establish national A3 technician certification

Link green building finance to code compliance

Integrate R290 into National Cooling Action Plans

Cross-cutting: Inter-ministerial coordination mechanism linking Energy + Environment + Fire Authorities

The Window of Opportunity — Act Before Lock-In



Two Trajectories

Business as Usual

- R-32 trajectory continues
- 61 Mt CO₂e refrigerant banks added annually
- AC emissions soar as stock triples by 2050
- Codes unchanged = technology lock-in

R290 Pathway

- Building codes updated now
- 72% of AC-related emissions avoidable by 2050
- 25% cut in total AC sector GHG emissions
- Energy savings + climate benefits + lower costs

The Numbers That Matter

72%

AC emissions avoidable by 2050 with natural refrigerant deployment (IKI Cool Up)

4.5M

AC units in Jordan by 2050 (from 1M in 2020) — pattern repeated across dozens of countries

20-30

Years: Lifetime of building codes. Decisions made today lock in refrigerant choices for decades.

Key Ask: Governments commit to IEC 60335-2-40 adoption and inter-ministerial code coordination within 24 months.

The Code Is the Key

Align. Enable. Scale.

R290 is ready. The market is ready. The finance is available.

Building codes sit at the intersection of safety, energy, and climate — uniquely powerful levers.

"Too green to scale?" — No. Too slow to regulate. Let's fix that.



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