



## Policy Brief

# Residential Photovoltaic Adoption in Austria: The Structural Imperative of Multi-Family Housing Reform

Kagan Yüksel<sup>1</sup> and Reinhard Madlener<sup>1</sup>

*<sup>1</sup>Chair of Energy Economics and Management, Institute for Future Energy Consumer Needs and Behavior (FCN), School of Business and Economics / E.ON Energy Research Center, RWTH Aachen University, Mathieustrasse 10, 52074 Aachen, Germany*

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## Introduction

Austria has committed to sourcing 100% of its electricity consumption from renewable sources by 2030 and achieving economy-wide climate neutrality by 2040 (Bundesministerium für Klimaschutz [BMK], 2020). The Renewable Energy Expansion Act (*Erneuerbaren-Ausbau-Gesetz* [EAG], BGBl. I Nr. 150/2021) allocates 11 TWh of the required 27 TWh of additional renewable generation to photovoltaics, primarily through the “1 Million Roofs” initiative. By the close of 2024, Austria had deployed approximately 9.4 GW of cumulative PV capacity, producing 7.7 TWh and covering roughly 11.4% of national electricity demand (IEA-PVPS, 2025). While annual installations have exceeded 2 GW for two consecutive years, the pace required to meet 2030 targets remains formidable—and structurally uneven across private household segments.

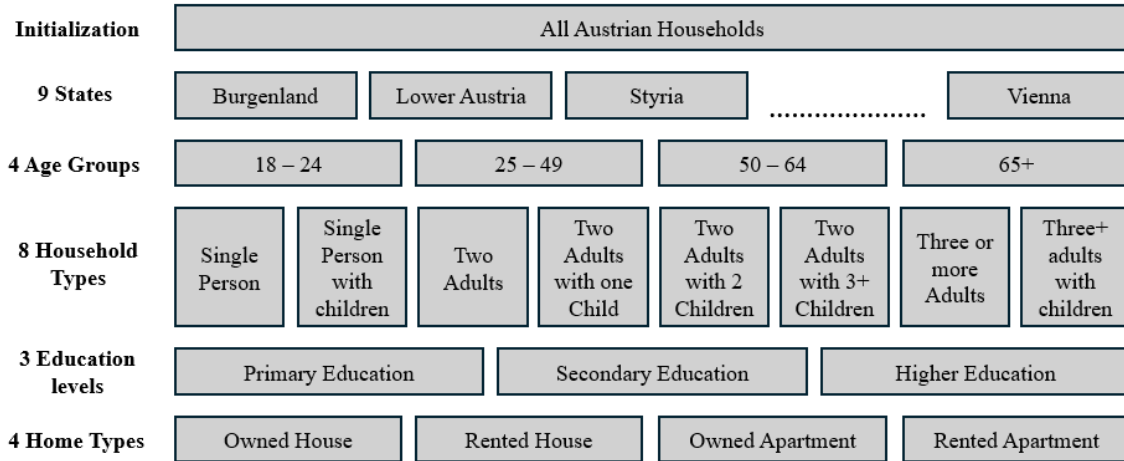
Approximately 45% of Austrian households reside in multi-family housing (MFH), predominantly as tenants. Current regulatory frameworks, notably the Condominium Act (*Wohnungseigentumsgesetz* [WEG 2002]) and the Tenancy Act (*Mietrechtsgesetz* [MRG]), impose procedural barriers that impede PV deployment on shared rooftops. Although the 2024 WEG amendment (BGBl. I Nr. 120/2024) introduced a simplified consent mechanism for balcony-mounted micro-systems below 0.8 kW, this provision addresses only a marginal fraction of available residential PV capacity. Full-scale rooftop installations in MFH buildings remain contingent upon collective owner consent and landlord–tenant coordination, effectively excluding a near-majority of the housing stock from participation in the energy transition.

This policy brief synthesizes findings from two complementary modelling approaches developed within the FFG-funded research project FutuRES-PV. An agent-based model (ABM) with state-level (*Bundesland*) resolution examines spatial heterogeneity in the adoption potential, while a national longitudinal simulation tracks household-level PV uptake across twelve policy scenarios spanning 2008–2040. Together, the analyses establish that the MFH restriction constitutes the single-most consequential structural barrier to residential PV diffusion—one that neither technology cost reductions nor subsidy programmes can circumvent through conventional policy instruments.

## State-Level Analysis: Agent-Based Model Findings

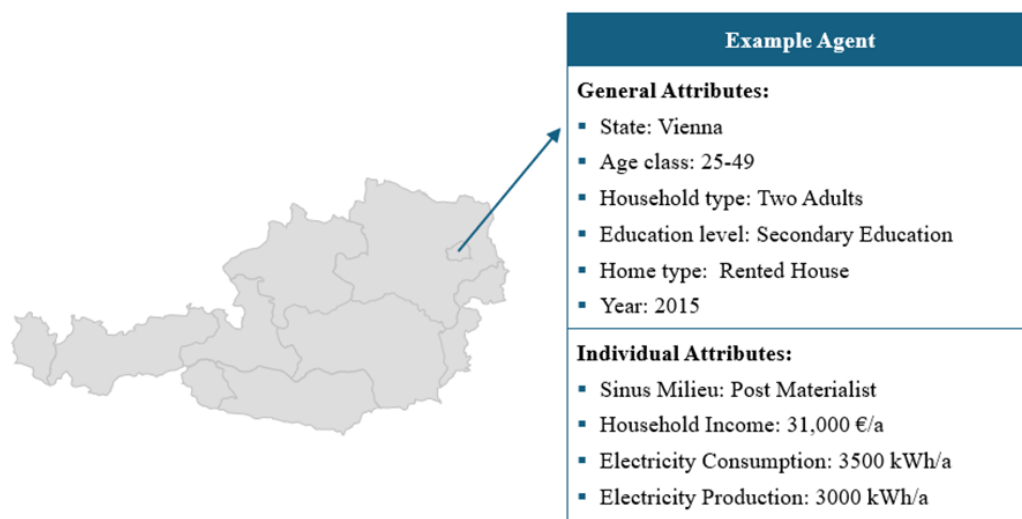
The agent-based model with state-level resolution tracks residential PV adoption across an identical timeframe as the national longitudinal simulation. It represents each Austrian household as an autonomous decision-making agent characterised by a set of socio-economic and dwelling attributes. As illustrated in Figure 1, segmenting the population by federal state,

age group of the primary income earner, household composition, education level, and home type yields an initial set of 3,456 distinct agent combinations. Age group and household type categories were determined on the basis of available survey data, while education levels follow the International Standard Classification of Education.



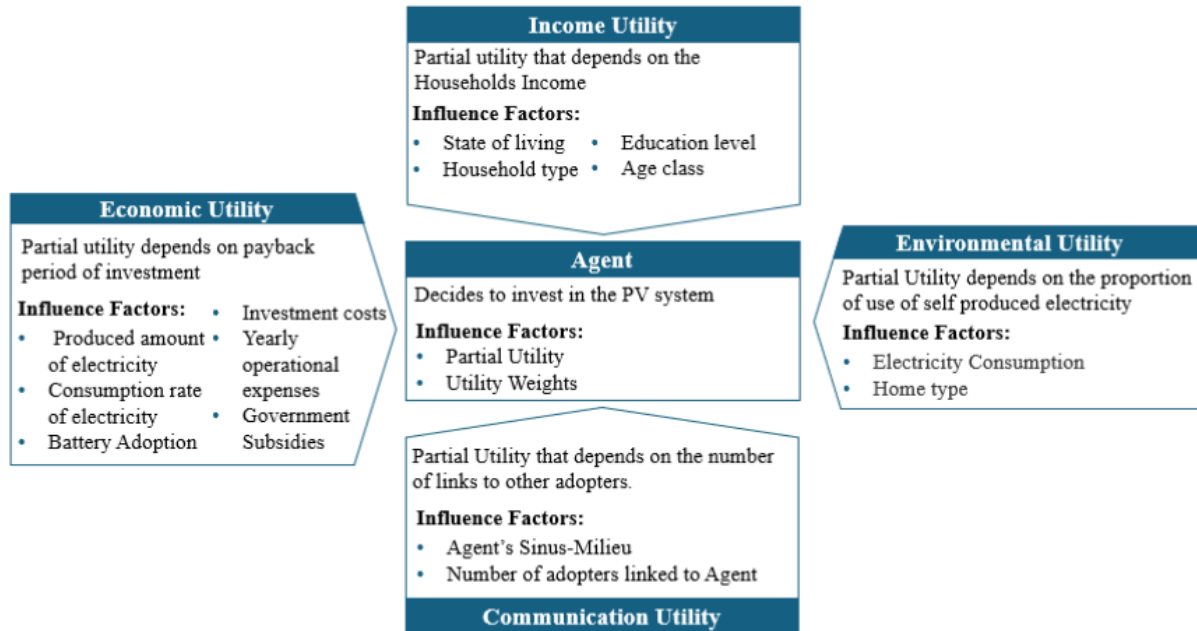
**Figure 1**  
*Agent Segmentation*

Beyond this categorical segmentation, probability distributions are employed to introduce within-group heterogeneity. Each agent receives individually sampled values for electricity consumption, disposable income, Sinus-Milieu classification, and available rooftop area conditioned on home type. Figure 2 illustrates the attribute profile for a representative Viennese household processed by the ABM, distinguishing between group-level and individually assigned characteristics.



**Figure 2**  
*Agent Attributes*

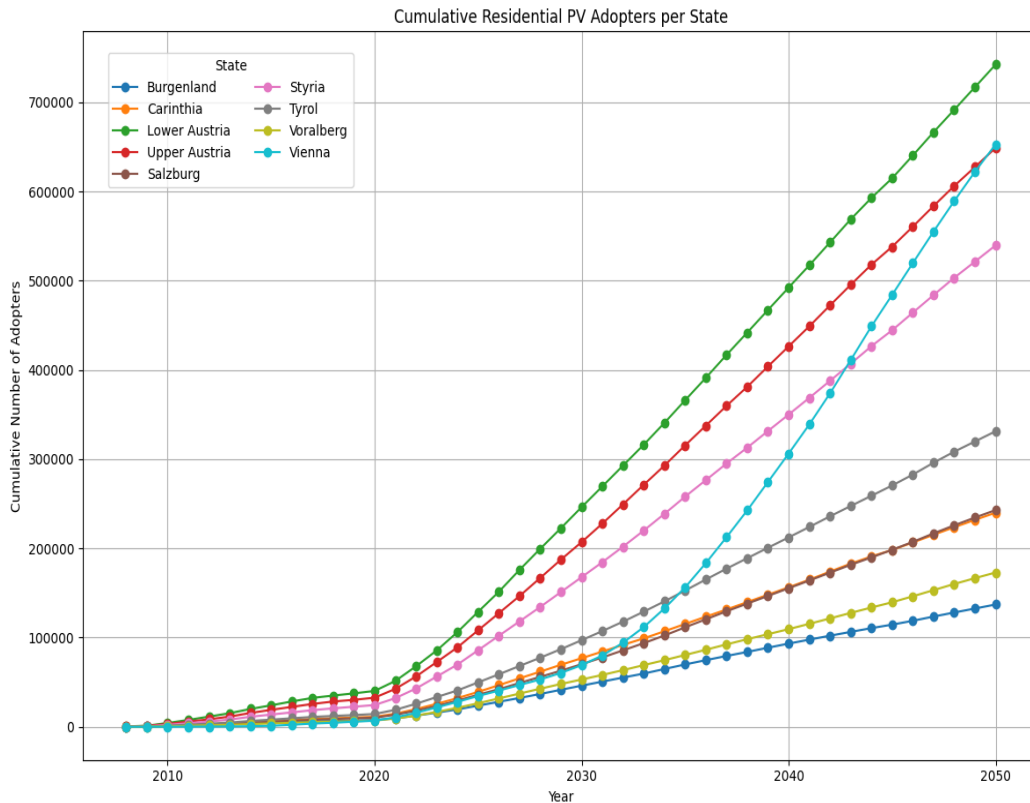
Each household agent evaluates a PV investment decision on the basis of a composite utility function. Adoption occurs when this utility exceeds a calibrated threshold, established through alignment with historical deployment data and held constant throughout the projection horizon. The composite utility comprises four weighted partial utilities, depicted in Figure 3.



**Figure 3**  
*Partial Utilities and Their Influence on Agents*

These partial utilities are recalculated annually for every eligible household. Upon adoption, an agent exits the eligible pool for the duration of the system's operational lifetime of approximately 25 years. Each partial utility is shaped by a distinct set of determinants, as indicated in Figure 3, ensuring that adoption propensity varies both across agent types and over time as economic and technological conditions evolve.

On the basis of these factors, the ABM was calibrated against historical adoption data and subsequently applied to generate state-level projections from 2025-2040. The results, initially presented to project stakeholders in February 2025, reveal that the distribution of housing types across Austria's nine federal states constitutes a primary determinant of regional adoption potential. Figure 4 illustrates how the varying prevalence of housing types (*Single Family Homes (SFH) vs. Multi Family Homes (MFH)* and *Owned vs. Rented*) across different states affects the adoption dynamic of each state.



**Figure 4**  
*Cumulative Projected PV Adoption per State*

As Figure 4 demonstrates, Vienna—the state with the highest population density and the largest share of MFH—exhibits the greatest untapped adoption potential. No combination of subsidy intensification or technology cost reduction in the ABM produces adoption levels comparable to those achievable through regulatory reform enabling MFH participation. This finding motivates the central question addressed by the national simulation: to what extent does the MFH exclusion constrain aggregate adoption at the national level, and can conventional policy instruments compensate for this structural barrier?

### National Simulation Results

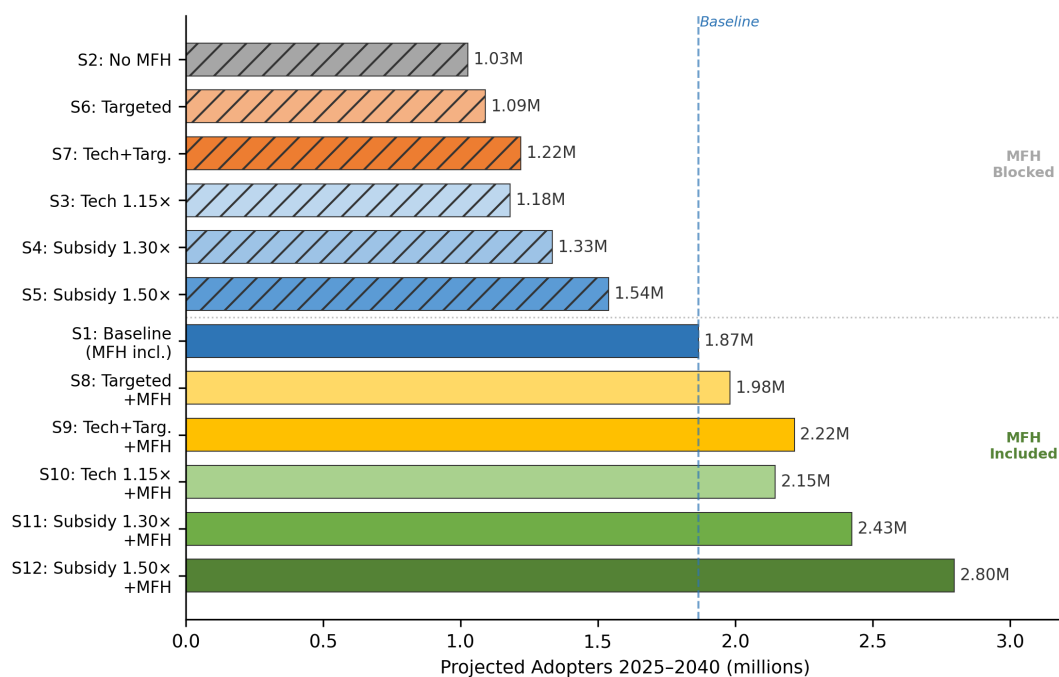
To complement the spatially resolved ABM and to provide nationally aggregated inputs for downstream macroeconomic modelling, a second simulation was developed with a consolidated segmentation framework. The national simulation tracks residential PV adoption across forty household segments—defined by two age brackets (18–49 and 50+), four housing tenure types (SFH Owned, SFH Rented, MFH Owned, MFH Rented), and five income quintiles (Q1–Q5) distributed according to Austria’s income distribution—over a 16-year horizon.

Twelve scenarios are evaluated (S1 to S12), each defined by three policy levers: a boost multiplier reflecting subsidy intensity or technology cost reduction, an income-quintile

activation schedule governing when lower-income segments enter the market, and the MFH eligibility setting. All scenarios share a common historical calibration phase (2008–2024) anchored to observed adoption data; divergence occurs exclusively during the projection period (2025–2040). Adoption within each year is allocated across active quintiles according to propensity-weighted shares, producing a natural diffusion from higher-income early adopters toward broader income segments as high-income household pools deplete over time.

### The MFH Restriction as a Binding Constraint

Under current tenure regulations, MFH households are effectively excluded from residential PV adoption. The baseline scenario (S1) assumes that this restriction was lifted, and all housing types are eligible; it reproduces the master adoption trajectory of 1.87 million projected adopters during 2025–2040. When the MFH restriction is imposed (S2), cumulative adoption decreases to 1.03 million—a reduction of 45%, corresponding precisely to the 45% MFH share of the housing stock. This proportionality is not coincidental; it reflects the structural absence of an entire tenure class from the addressable market. Even under the most aggressive uniform subsidy modelled (S5, 1.50× boost with MFH blocked), projected adoption reaches only 1.54 million—82.5% of the unrestricted baseline. By contrast, the same 1.50× subsidy paired with MFH market access (S12) yields 2.80 million projected adopters—a 50% improvement over baseline conditions. Figure 5 presents the comparative projection totals across all twelve scenarios.



**Figure 5**  
Projected cumulative PV adopters (2025–2040) across twelve policy scenarios. Hatched bars denote scenarios

with MFH adoption blocked; solid bars indicate MFH included. The dashed line marks the baseline reference (S1).

### Subsidy and Technology Cost Effects

Within the MFH-blocked family of scenarios, uniform boost multipliers produce strictly proportional increases in adoption: a 15% technology-driven cost reduction (S3) raises projected adoption by precisely 15% relative to S2, a 30% subsidy (S4) produces a 30% increase, and a 50% subsidy (S5) achieves exactly 50% additional uptake. These proportional relationships hold on a year-by-year basis, not merely in aggregate—a consequence of the consistent historical calibration architecture across different scenarios of the national model. The same proportionality applies to the MFH-included family (S10, S11, S12 relative to S1). This predictability carries a sobering implication: subsidies operate as linear multipliers on a structurally constrained base. Even the most generous intervention cannot exceed 82.5% of baseline performance as long as MFH remains excluded ( $0.55 \times 1.50 = 0.825$ ).

### Targeted Versus Broad Interventions

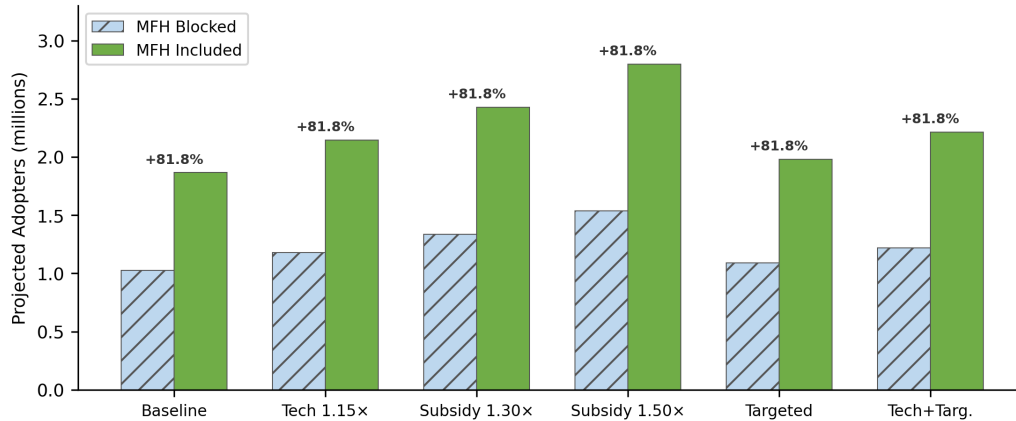
Scenarios S6 and S7 evaluate equity-oriented policies that concentrate a 1.50× subsidy on the lowest two income quintiles (Q1–Q2) while leaving higher-income quintiles at baseline (S6) or at a modest technology-driven 1.15× boost (S7). Although these designs achieve earlier activation of lower-income segments, their aggregate impact is limited: S6 reaches only 1.09 million projected adopters, falling 6% below the unsubsidised S2 baseline for the MFH-blocked case. S7, which adds a technology component, attains 1.22 million. In both instances, aggregate performance remains substantially below the uniform 1.50× subsidy (S5, 1.54 million). The underlying mechanism is structural: the two lowest income quintiles command approximately 11.4% of total adoption propensity weight (1.25 + 1.0 out of 19.75), limiting the influence of quintile-targeted subsidies on the effective boost.

This result does not diminish the equity rationale for targeted instruments. Rather, it demonstrates that targeted subsidies alone are insufficient to close the volume deficit created by the MFH restriction. A combined strategy—tenure reform to unlock the MFH market alongside targeted support for lower-income adopters—delivers materially different outcomes: S8 (targeted + MFH) reaches 1.98 million and S9 (tech + targeted + MFH) reaches 2.22 million, both exceeding unrestricted baseline levels.

### The MFH Unlock Effect

Across all five paired comparisons (S2/S1, S3/S10, S4/S11, S5/S12, S6/S8, S7/S9), lifting the MFH restriction produces a constant uplift of +81.8% in projected adoption.

Crucially, this increase is entirely additive: single-family housing (SFH) adoption remains identical between paired scenarios, with the supplementary volume originating exclusively from newly addressable MFH households. Figure 6 illustrates these paired comparisons.



**Figure 6**

*Paired comparison of projection-phase adoption under MFH-blocked and MFH-included conditions across six policy configurations. The constant +81.8% uplift is entirely attributable to newly accessible MFH households.*

This structural invariance carries important policy implications. Enabling MFH adoption does not redirect investment away from single-family households or reduce their adoption rates; it expands the total addressable market by activating a housing segment that current regulatory frameworks leave structurally idle. The magnitude of this effect—consistent across subsidy levels, technology assumptions, and income-targeting designs—suggests that tenure reform constitutes a necessary precondition for any scenario in which Austria meets or exceeds its baseline adoption trajectory.

## Policy Implications

The convergent findings from the agent-based and national simulation models point toward three principal conclusions for Austrian energy and housing policy:

**First, the MFH restriction is the binding constraint on residential PV expansion.** No combination of subsidy intensification or technology cost reduction achieves baseline-equivalent adoption without enabling MFH participation. Legislative reform of the WEG 2002 and MRG—extending beyond the 2024 balcony micro-PV provision to encompass full rooftop installations through streamlined collective consent or opt-out mechanisms—is a prerequisite for unlocking the 45% of household stock currently excluded.

**Second, MFH reform is additive, not redistributive.** SFH adoption is entirely unaffected by the introduction of MFH eligibility. This finding directly addresses stakeholder concerns regarding cannibalisation of existing SFH programmes: the +81.8% aggregate uplift represents

genuinely incremental demand. Policymakers can pursue MFH reform without apprehension that existing SFH incentive structures will be undermined.

**Third, equity and volume objectives require complementary instruments.** Targeted low-income subsidies advance distributional goals but generate limited aggregate volume, while broad household subsidies concentrate adoption benefits among higher-income cohorts. Combining tenure reform with income-targeted instruments—as modelled in scenarios S8 and S9—delivers both volume gains exceeding baseline levels and meaningful participation from lower-income quintiles.

## **Conclusion**

Austria's photovoltaic expansion trajectory through 2040 is contingent upon resolving a structural impediment embedded in its housing tenure framework. The present analysis demonstrates—through both spatially disaggregated and nationally integrated modelling—that multi-family housing reform is not one policy option among several but rather a necessary condition for meeting decarbonization targets set forth in the EAG and Austria's national climate strategy. The 45% of households residing in MFH represent the single-largest untapped reservoir of residential PV capacity. Unlocking this potential through targeted amendments to the WEG and MRG would generate an estimated +81.8% increase in projected residential adoption without reducing SFH uptake—making it the most impactful individual lever available to Austrian policymakers in the residential PV domain.

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