=== Tuning XGBoost ===

Best Params: {'learning\_rate': 0.1, 'max\_depth': 6, 'n\_estimators': 200}

MSE: 9333.5923

Training Time: 4.98s

=== Tuning LightGBM ===

Best Params: {'learning\_rate': 0.1, 'max\_depth': 6, 'n\_estimators': 200}

MSE: 9639.5228

Training Time: 19.82s

=== Tuning Random Forest ===

Best Params: {'max\_depth': 6, 'n\_estimators': 200}

MSE: 16021.9555

Training Time: 51.71s

=== Tuning HistGradientBoosting ===

Best Params: {'learning\_rate': 0.1, 'max\_depth': 6, 'max\_iter': 200}

MSE: 9723.8515

Training Time: 7.74s

=== Tuning CatBoost ===

Best Params: {'depth': 6, 'iterations': 200, 'learning\_rate': 0.1}

MSE: 10692.3797

Training Time: 23.14s

=== Model Performance Summary ===

MSE Time (s)

XGBoost 9333.592312 4.98

LightGBM 9639.522789 19.82

HistGradientBoosting 9723.851545 7.74

CatBoost 10692.379701 23.14

Random Forest 16021.955533 51.71