

AMID



Machine Learning as a foundation for **Pay-as-you-Save** models
for Buildings' **Energy Efficiency**



Max Carrel
Head of
Technology
mca@e-nno.ch

Real estate in Switzerland

+1,8M buildings heated

75% built before 1990

45% of final energy consumption

30% of CO₂ emissions

E-NNO Service

Digitalize any building



E-NNO Service

Digitalize any building



Automated optimization



E-NNO Service

Digitalize any building



Automated optimization



2 months to savings

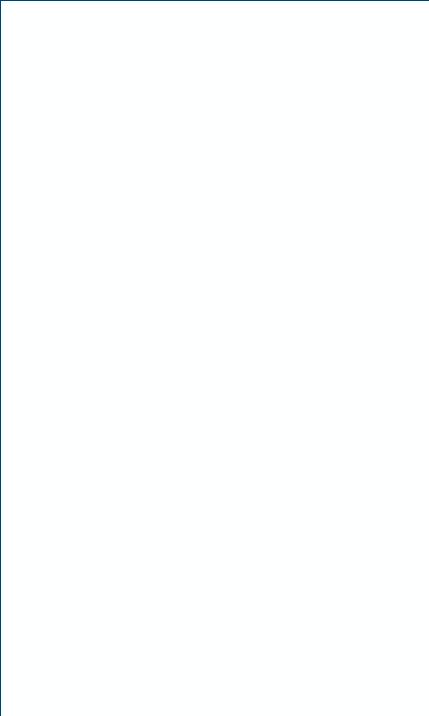


10% - 35% carbon footprint reduction

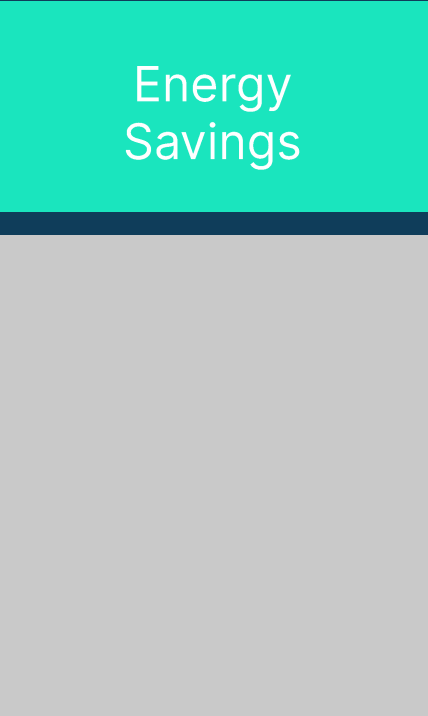


Pay-as-you-save Model

Pay-as-you-save model



Baseline energy consumption

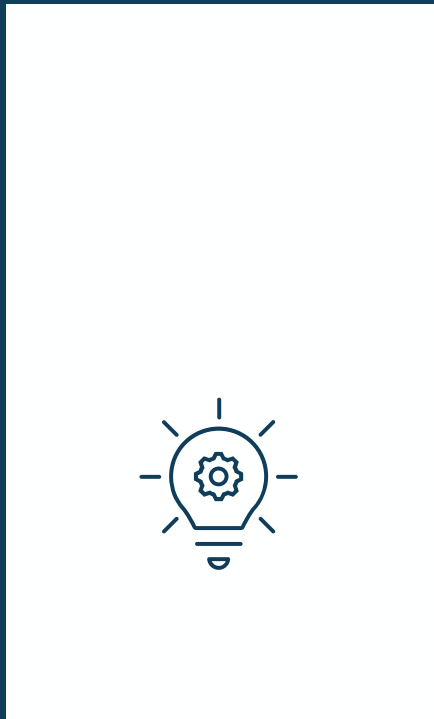


Actual energy consumption

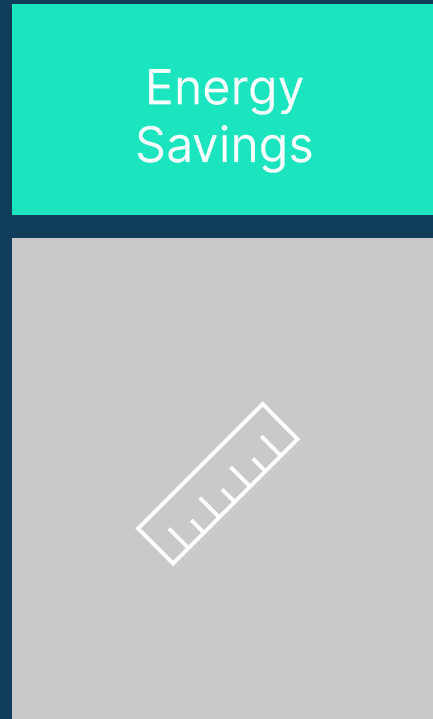


Cost Savings

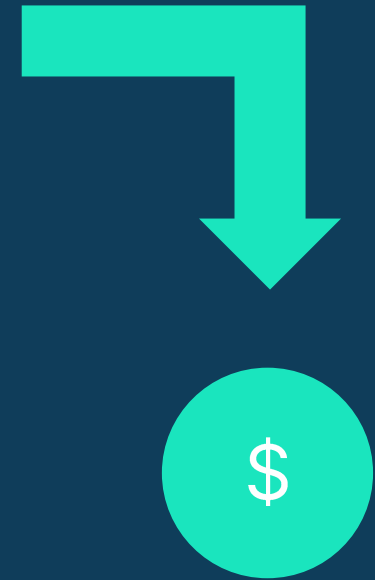
Pay-as-you-save model



Baseline energy consumption



Actual energy consumption



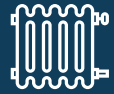
Cost Savings

Modelling Constraints

- › Model used for invoicing
- › High variability in thermal dynamics
- › Frequent anomalies
- › No energy savings in baseline period

- › Interpretable model
- › One model per building
- › Robust model fitting
- › Data efficient model

Modelling Variables



Heating Period



Wind Speed



Outdoor Temperature



Wind Direction

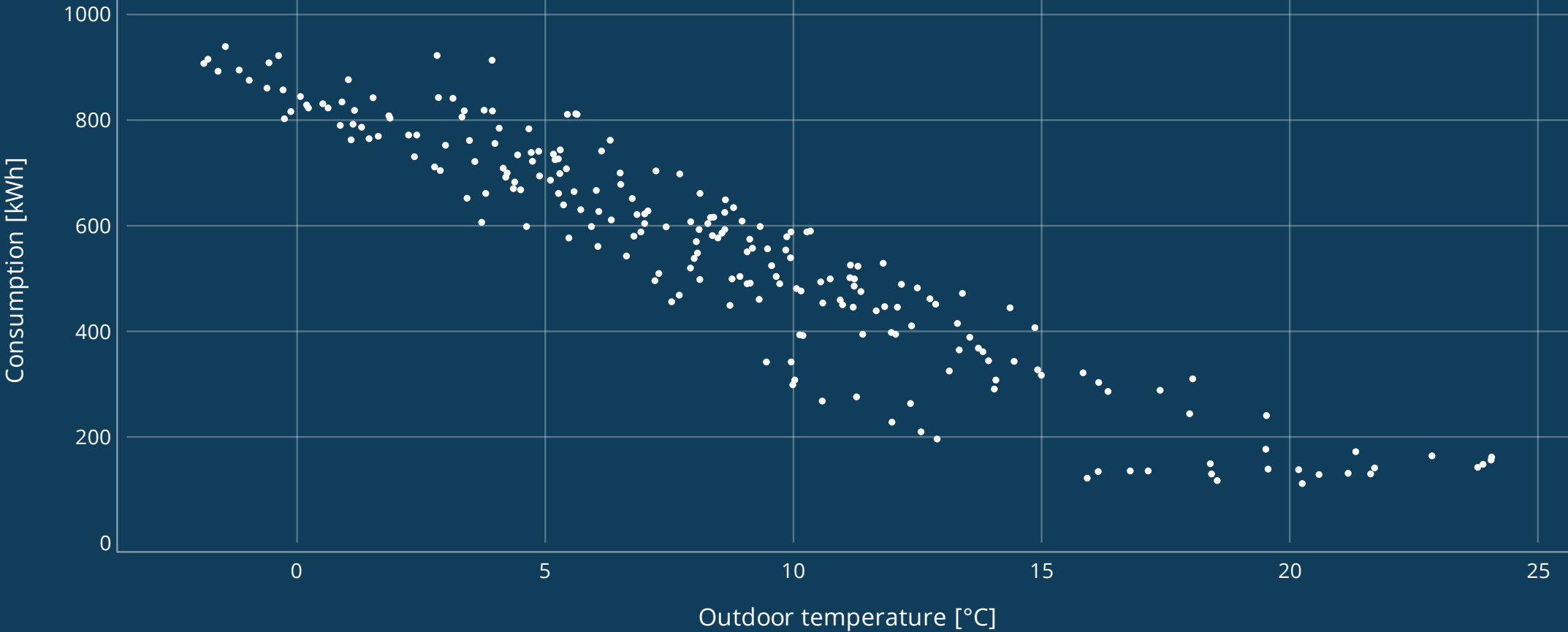


Solar Irradiance



Rain

Consumption Data



Energy Savings Computation



Conclusion

- › The pay-as-you-save model is an extremely powerful way to finance energy efficiency intervention

- › The presented approach is best suited when:
 - › Detailed data is available
 - › Energy consumption predictability is sufficient



Thank you for your attention !

info@e-nno.ch | www.e-nno.ch

+4158 810 34 00

