The Future of Heating is Bandwidth

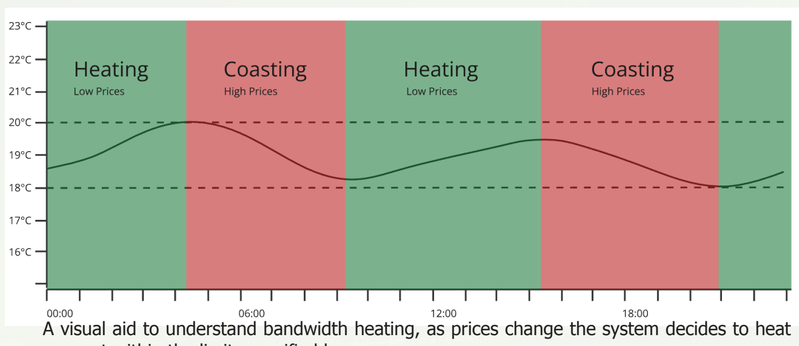
Cheaper Heating by Leveraging Temperature Ranges to Shift Energy Consumption

Problems Hampering Heating Innovation

In innovating alternative energy heating, systems like Heat-Pump-Fed District Heating (HPDH) offer a sustainable option. This is a method to power neighbourhoods by one heating system, in this case: an array of heat pumps as developed by DEP. However, these systems face issues as traditional thermostats cannot leverage fluctuating energy prices. Existing thermostats are designed for fixed setpoints, and can't modulate based on real-time hourly energy cost. This project addresses the need for smarter, more adaptive control systems that reduce costs and make HPDH a more competitive product.

Heat Automation with Bandwidth Temperature Ranges

The designed logic is bandwidth heating, where a desired temperature range is selected, rather than a setpoint. Within this range the system optimises by shifting consumption to the cheap hours, and using the home as a heat-battery in coasting over expensive hours. As renewable energy influxes lower the energy price, 95% of consumption moves to greener energy. Simulations achieve an average 13% decrease in costs over a fixed thermostat, based on the past ten years of data.

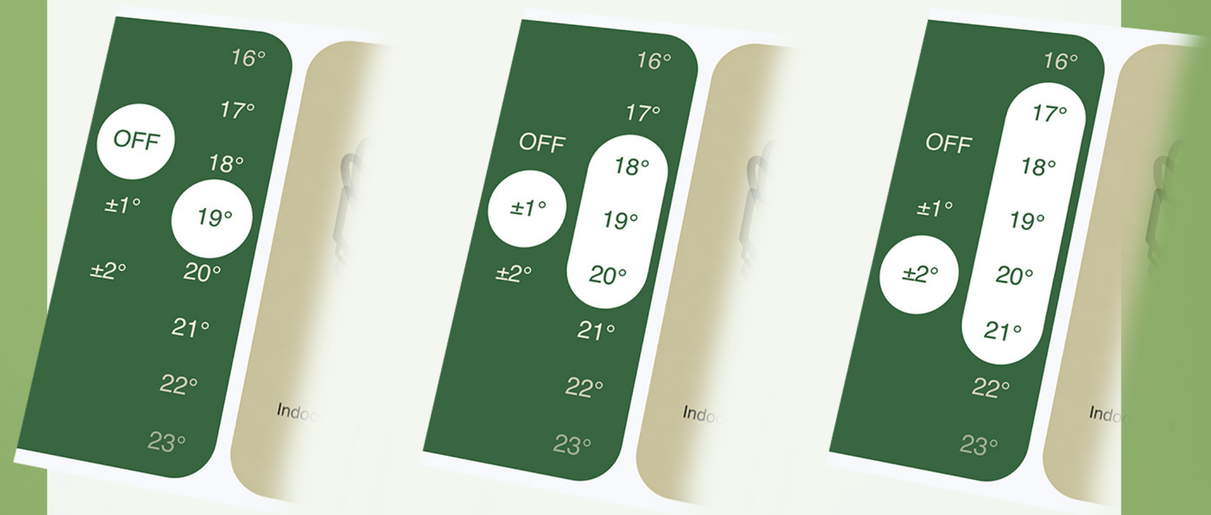


A visual aid to understand bandwidth heating, as prices change the system decides to heat or coast within the limits specified by a user.

The interface home screen: three windows let the user adjust bandwidth subscription, view current system state and dive into submenus that address cost comparisons, savings insights, avatar explanation and retake the first-time user tutorial.

User Control Interface for Bandwidth System

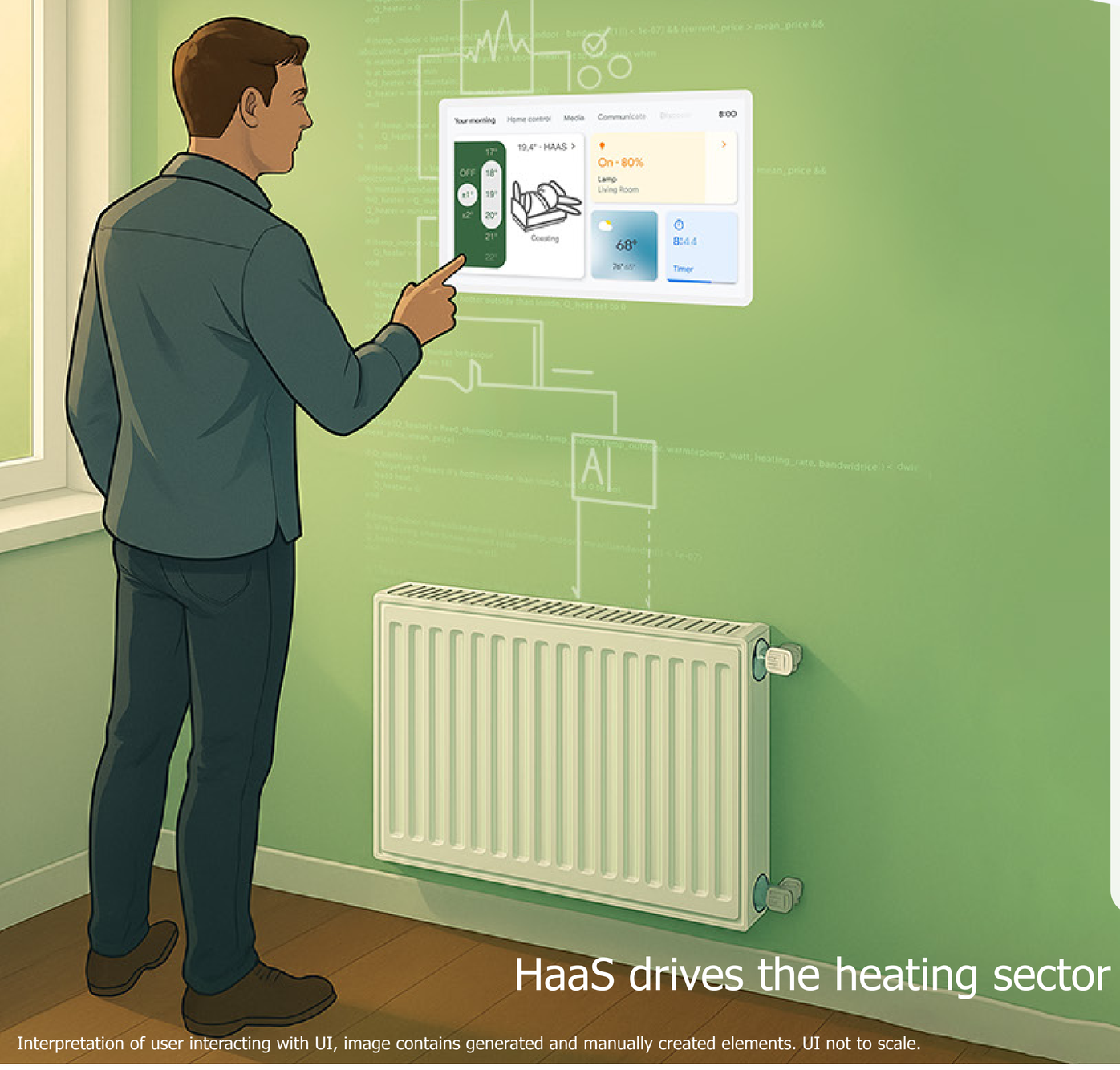
The bandwidth heating is offered in Heating-as-a-Service (HaaS) subscription, which allows automation over heating to optimise energy use. The interface lets users set a temperature range using bandwidth controls, developed for this thesis. This interface visually displays the target temperature range dynamically upon user adjustment.



The bandwidth window dynamically adjusts based on selected bandwidth size, the user is informed on how their settings are expected to influence their consumption pattern and costs.

This design provides a clear and simple way for users to engage with smart heating, offering both control and transparency. It includes user feedback and an avatar, fostering user understanding and trust in HaaS.

The avatar is explained to users in a seperate window, and is central to the UI. It conveys system state through the icon and accompanying text. As a memory refresh, all avatar options are listed with explanation in a seperate window.



HaaS drives the heating sector towards a cost-effective, low-carbon future!

Interpretation of user interacting with UI, image contains generated and manually created elements. UI not to scale.

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