

Practical Energy Guide for Swedish Single-Family Homes

Simple steps to improve comfort,
reduce energy use, and save money

A Free, Independent Energy Guide

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Disclaimer

Important Legal Information:

The information in this guide is provided for educational purposes only. While every effort has been made to ensure accuracy, the author and publisher assume no responsibility for errors, omissions, or damages resulting from the use of this information.

Price disclaimer: All prices, costs, savings estimates, and payback periods in this guide reflect typical Swedish averages for 2024–2025. Energy markets fluctuate significantly due to season, region, supplier, and global conditions. Electricity, oil, wood, district heating, and grant amounts change over time. **Always verify current rates, grant availability, and installation costs with your specific supplier, installer, or Energimyndigheten before making investment decisions.**

Professional advice: Always consult licensed professionals for:

- Electrical work (including main fuse upgrades, heat pump connections)
- Gas system work
- Structural modifications
- Asbestos testing and removal

Energy savings vary based on individual circumstances, local climate, and existing building conditions. The examples and savings ranges in this guide are indicative and should be used as guidance rather than guarantees.

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One-Minute Summary

Do These Three Things Today:

1. **Lower your thermostat by 1°C** → saves 5% on heating
2. **Check attic insulation depth** → if less than 200mm, plan to add more
3. **Unplug one device you don't use** → saves 50-200 SEK/year instantly
4. **Replace your most-used bulb with LED** → saves 50-100 SEK/year per bulb

Then make a plan based on your budget:

Budget	Start with these chapters
0–500 SEK	Chapter 2 (Quick Wins)
500–5,000 SEK	Chapter 2 – Draft sealing kit
5,000–50,000 SEK	Chapter 2 + Attic insulation (Chapter 4)
50,000+ SEK	Chapter 12 (Upgrade Plans by Budget)

Remember: The Swedish state pays for part of your upgrades through **RUT-avdrag** (50% off labor) and **Energimyndigheten grants**. **Grants for energy upgrades in single-family houses:**

The Swedish Energy Agency (Energimyndigheten) does not provide grants directly to homeowners. Instead, the main grant for house energy efficiency comes from **Boverket**.

Link: [Click here for Boverket's grant information](#)

Maximum amount: 60,000 SEK per house

Eligibility: Houses with electric or gas heating

Free advice: Your municipality offers free, independent energy advice. Find your local advisor at www.energioklimatradgivningen.se

Introduction

Your Digital Companion: The Nexus Energy Audit Tool

Don't just read — calculate. Use the free tool to understand your building's energy consumption and discover which optimization measure would save you the most.

What the tool does

- Calculates your current energy use (EUI)
- Compares different energy sources (SEK/kWh)
- Simulates savings from insulation, heat pumps, and ventilation
- Shows payback periods for upgrades
- Generates a printable report

How to access the tool:

Simple process:

1. Email us at: info@nexusenergy.se
2. Include either:
 - A request for the calculation sheet, OR
 - Your data plus the upgrades you're considering

We reply within 24 hours with the calculation sheet attached.

No sign-up. No cost. No ads. Just a tool to help you make better decisions.

This tool exists because homeowners should not pay for basic calculations.

Energy literacy shouldn't come with a price tag. This tool puts essential calculations in your hands — for free.

Disclaimer: The Nexus Energy Audit Tool is provided for informational purposes only. Results are estimates based on user-provided data. Actual savings may vary.

Part I

Foundation

Chapter 1

Before You Start: Safety First

Safety saves money and lives. Some jobs require a licensed professional. Know your limits.

1.1 When to Call a Professional

Never Attempt These Yourself:

- **Gas systems:** Any work on gas boilers, pipes, or connections requires a certified technician. Gas leaks can be fatal.
- **Electrical panels:** Upgrading fuses, installing EV chargers, or connecting heat pumps to the main grid requires a licensed electrician.
- **Asbestos:** In houses built before 1980, insulation, floor tiles, or pipe wrapping may contain asbestos. Disturbing it releases toxic fibers. *Test before you tear.*
- **Structural walls:** Do not cut into load-bearing walls to run pipes or wires without an engineer's approval.
- **Black mold:** If you see black spots on walls, do not just scrub them. This indicates a moisture problem that requires professional remediation.

1.2 Check Your Main Fuse First

 **Critical:** Before buying any major electrical equipment (heat pump, EV charger, induction stove), check your main fuse.

Many Swedish homes, especially from the 1960s and 70s, were built with electrical capacities that are insufficient for modern electrification.

The Hidden Bottleneck:

- Modern equipment often requires **20A or 25A** main fuses
- Older homes often have **10A or 16A**
- Installing high-load devices on weak fuses causes constant breaker trips
- Upgrading costs **5,000–15,000 SEK** (electrician + grid operator fees)

Action Plan:

1. Check your main fuse rating (look at the main breaker in your fuse box)

2. If it is 16A or lower, **do not buy a heat pump or EV charger yet**
3. Consult an electrician about the cost of a fuse upgrade
4. Factor this cost into your ROI calculation

1.3 Basic Safety Reminders

- **Ladder safety:** When checking your attic, ensure the ladder is stable. Never overreach.
- **Electrical safety:** Never touch electrical components with wet hands. Turn off power before inspecting panels.
- **Crawl spaces:** Use a flashlight, wear gloves, and tell someone you're going in.

Chapter 2

Quick Wins (Low Cost, High Impact)

Do these first. Most households can reduce energy use by 5–15% with these measures alone.

This chapter focuses on actions that are inexpensive, low-risk, and can be done by most households without professional help.

✂️ **Total cost of these improvements:** 0–1,500 SEK. **Expected savings:** 5–15%.

2.1 Seal Drafts First

Cold drafts increase heating demand and reduce comfort. Sealing them is usually the single best first action.

Typical problem areas:

- Doors to the outside and to unheated spaces
- Window frames and joints between frame and wall
- Attic hatches
- Pipe and cable penetrations

Use weatherstripping or rubber seals designed for cold climates. **Avoid sealing ventilation openings.**

Draft Detection: If you feel cold air on your hand, or if a candle flame flickers near a window or door, it is worth sealing.

2.2 Tune Radiators and Thermostats

Poorly adjusted radiators are common in Swedish houses, especially older ones.

Check the following:

- Radiators should be warm at the top and slightly cooler at the bottom
- All radiators should start heating at roughly the same time
- Thermostatic radiator valves (TRVs) should not be blocked by furniture or curtains

 **Important:** Turning a TRV to maximum does *not* make a room heat up faster. It just raises the target temperature.

- **Lowest comfortable setting** means the valve closes sooner, saving energy
- **Turning fully up** means the valve stays open longer, overheating the room

Set TRVs to the lowest comfortable setting (typically 3 = 20°C).

2.3 Ventilation Tuning for Your System Type

Dirty or incorrectly adjusted ventilation increases energy use and worsens indoor air quality.

2.3.1 If you have självdrag (natural ventilation):

- Clean all wall vents (friskluftsventiler)
- Ensure vents are not painted shut
- DO NOT seal all drafts - your house needs some air leakage
- Use kitchen fan when cooking to pull fresh air through the house

2.3.2 If you have F-system (exhaust-only):

- Clean bathroom and kitchen fan grilles
- Check that fresh air vents are open
- Replace old fans with efficient EC-motor fans (3,000-8,000 SEK ¹)
- Add a timer or humidity sensor to avoid running fans 24/7

What is an EC motor?

EC stands for "Electronically Commutated." Think of it as a super-efficient motor for fans.

- Old fan motor: Uses 100W continuously
- New EC motor: Uses 30-50W for the same airflow
- Savings: 50-70% less electricity

If your ventilation fans run 24/7 (like F-system exhaust fans), replacing them with EC motors can save 500-2,000 SEK/year.

Where to find: Look for "EC motor" or "EC technology" in the product description. Most major fan manufacturers now offer EC motor versions. Ask your local electrical wholesaler or ventilation installer for "EC replacement fans" - they will know what you mean.

2.3.3 If you have FTX:

- Change filters every 3 months
- Check that vents aren't blocked by furniture
- Listen for unusual fan noise (indicates problem)

Ventilation Balance: Good ventilation reduces moisture problems. However, avoid increasing ventilation unnecessarily during winter — more air exchange means higher heating demand.

¹Prices based on 2025-2026 market averages; verify current pricing locally

2.4 Reduce Hot Water Energy Use

Hot water often accounts for 15–25% of household energy use.

First, identify your DHW system:

- Separate electric water heater
- Part of heat pump
- District heating
- Oil boiler

Universal savings (work for ANY system):

- Install low-flow shower heads (300–800 SEK)
- Insulate exposed hot water pipes (200–500 SEK)
- Reduce shower time by 2 minutes → saves 1,000–2,000 SEK/year for family of four
- Install timer on circulation pump (500–1,000 SEK) → saves 200-500 kWh/year

For electric water heaters only:

- Insulate the tank (500–1,000 SEK jacket)
- Add a timer (500–1,000 SEK)
- Lower temperature to 60°C (never below 55°C)

Table 2.1: Recommended Hot Water Temperatures for Different Activities

Activity	Temperature (°C)
Handwashing	38–42°C
Showering	38–40°C
Bath (comfortable)	37–38°C
Kitchen dishwashing (by hand)	43–49°C
Dishwasher (machine)	49–60°C
Laundry (whites/heavy soil)	49–60°C
Laundry (normal/delicate)	30–40°C

 **Legionella safety:** Water heaters should store water at 60°C to prevent Legionella bacteria growth. Never lower storage temperature below 55°C. Use a thermostatic mixing valve to deliver safe 50°C water to taps.

2.5 One-Day Improvements (0–500 SEK)

Do these today. No tools, no installers.

- Lower your thermostat by 1°C → saves 5% on heating
- Replace your most-used bulb with LED (50-100 SEK²) → saves 50-100 SEK/year
- Unplug one device you don’t use → saves 50-200 SEK/year instantly

²Prices based on 2025-2026 market averages; verify current pricing locally

- **Clean the back of your refrigerator** → saves 100-200 SEK/year
- **Buy a power strip with switch** (50-150 SEK ³)
 - Many electronics draw power even when "off" (TV, game consoles, soundbars)
 - A power strip with a switch cuts power completely
 - Payback: 4-12 months
 - One click saves 100-200 SEK/year

2.6 For Tenants: What Can You Actually Do?

Renters have rights too. You don't own the walls, but you own your comfort.

Most of the energy-saving suggestions in this book apply to tenants as well — with one important difference: **always check with your landlord before making changes.**

2.6.1 What You Can Do

- **Most advice in Chapters 2, 8, and 9** (Quick Wins, Plugloads, Lighting) works for tenants
- **Choose removable solutions** when possible (silicone tape instead of permanent sealant)
- **Keep original parts** (bulbs, shower heads) to reinstall when you move

2.6.2 What Needs Landlord Approval

- Any structural changes (insulation, windows, ventilation)
- Heating system modifications (heat pumps, boiler changes)
- Electrical work
- Permanent sealants or adhesives

2.6.3 The "Landlord Negotiation" Strategy

If your apartment is drafty, cold, or has high humidity, the landlord is legally responsible.

1. **Document the problem:** Photos, temperature readings
2. **Use this book as evidence:** Show them relevant chapters
3. **Request specific fixes:** Weatherstripping, radiator balancing, ventilation check
4. **Follow up in writing:** Email creates a paper trail

Tenant rights in Sweden:

- Your home must maintain **minimum 18-20°C** during winter
- Landlord is responsible for the building envelope
- Contact **Hyresgästföreningen** (Tenant Association) for support

³Prices based on 2025-2026 market averages; verify current pricing locally

The golden rule: When in doubt, ask first. A landlord who says no to a simple draft seal is rare. Most will say yes — especially when you show them it saves *their* money too.

2.7 Checklist

- ☐ Lower thermostat by 1°C (saves 5%!)
- ☐ Find and seal one draft (door, window, or attic hatch)
- ☐ Clean refrigerator coils (back or bottom)
- ☐ Replace most-used bulb with LED
- ☐ Unplug one device you don't use
- ☐ Set TRVs to lowest comfortable setting (not maximum!)
- ☐ Clean bathroom and kitchen fan grilles
- ☐ Reduce shower time by 2 minutes

Chapter 3

Know Your House

Diagnose before you invest. Understanding where energy is usually lost in your type of house helps you focus on measures that matter most.

3.1 What Kind of House Do You Live In?

Swedish houses vary widely depending on the decade they were built:

- **1930s–1950s:** Often wooden structures, minimal insulation, single-glass windows
- **1960s–1970s:** Brick or concrete walls, basic insulation, drafty doors, older radiator systems
- **1980s–1990s:** Better insulation standards, double-glass windows, more airtight construction
- **2000s–present:** Modern insulation, efficient windows, often FTX ventilation

3.2 What Heating System Do You Have?

If you see...	You have...
A large tank in the basement	Oil boiler
A white box on the wall with a fan	Air-to-air heat pump
A unit outside connected to indoor radiators	Air-to-water heat pump
A stove with a glass door	Wood stove
No visible equipment (just radiators)	District heating

3.3 A 10-Minute Home Walk-Through

A short inspection helps identify obvious energy losses:

- **Drafts:** Check doors, windows, and attic hatches using your hand or a smoke pen
- **Attic:** Look at insulation depth and condition
- **Windows:** Inspect seals and look for condensation or cold spots
- **Ventilation:** Observe air movement from vents

- **Radiators:** Check if they are warm from top to bottom

3.4 What Ventilation System Do You Have?

Most Swedish homes have no heat recovery. That's normal. But knowing your ventilation type changes what advice applies to you.

Take 2 minutes to identify your system:

If you see...	You have...
Wall vents (friskluftsventiler) with no fans anywhere	Självdtag (natural ventilation)
Small fans in kitchen/bathroom + wall vents in rooms	F-system (exhaust-only)
A large box with filters + ducts to all rooms	FTX (heat recovery)
A metal box in the exhaust duct + existing F-system	Frånluftsvärmepump (exhaust air heat pump)

Quick check: On a cold day, hold your hand near a wall vent. If you feel cold air coming in, you have natural ventilation or F-system. If no air moves or it's warm air, you may have FTX.

Why this matters for you:

- **Självdtag:** Don't seal all drafts! Your house needs air leakage. Skip the FTX chapters (not relevant yet).
- **F-system:** Read the F-system section in Chapter 5. Consider adding a timer or exhaust air heat pump.
- **FTX:** Read the FTX section. Remember to change filters every 3 months.

The Confusion Between F and FTX Explained:

- **Självdtag (Natural ventilation)** = No fans. Air moves naturally through vents, cracks, and chimneys. The incoming air is COLD.
- **F-system** = Exhaust-only. Fans pull air OUT of bathrooms and kitchen. Fresh air enters through wall vents - AND IT IS COLD.
- **FTX** = Supply and exhaust with heat recovery. Both in and out. The incoming air is WARM (pre-heated by outgoing air).

Remember: Do you feel cold air coming from the vent? Then you do NOT have FTX.

Write down your ventilation type here: _____

3.5 Where Does Your Hot Water Come From?

Hot water is often 15-25% of your energy bill. Many Households don't realize they can optimize it separately from heating.

Find your hot water source:

If you see...	You have...
A large tank (50-200L) with electrical wires	Elberedare (electric water heater)
The same outdoor unit as your heating	Heat pump combined system
Pipes from the street to a heat exchanger	District heating (fjärrvärme)
No separate tank, water heated by oil boiler	Oil boiler with coil
Black panels on the roof (not glass/blue like PV)	Solar thermal (solfångare)

Quick check: Turn on a hot water tap. Does your heating system start running? If yes, they're connected. If not, you have a separate water heater.

Why this matters for you:

- **Separate electric water heater:** You can insulate it, add a timer, and lower temperature independently of heating.
- **Combined with heat pump:** Check your heat pump's DHW settings - many have separate efficiency modes.
- **District heating:** Focus on reducing usage (shorter showers, low-flow heads). You can't change the source.
- **Oil boiler:** Consider adding an electric water heater for summer use (saves running the whole boiler just for hot water).

Write down your DHW source here: _____

3.5.1 Do You Have a Circulation Pump (Cirkulationspump)?

This is often the biggest hidden energy waste. Many Households don't even know they have one.

How to check: Listen for a small pump humming near your water heater. It keeps hot water moving so you get instant hot water at taps.

If you have one:

- It likely runs 24/7 (wastes 200-500 kWh/year)
- Install a timer for 500-1,000 SEK → 1-2 year payback
- Run only morning and evening (6-9 AM, 4-9 PM)

No circulation pump? You're already saving energy. Wait 5-10 seconds for hot water - it's worth it.

3.6 Your Home's Energy Profile

Fill this out after reading this chapter. Keep it for reference.

My House Profile:

- Built in: _____ (1930s/1960s/1970s/1980s/1990s/2000s/2010s)
- Size: _____ m²
- Heating system: _____ (oil/electric/heat pump/district)
- Ventilation type: _____ (självdreg/F-system/FTX)
- Hot water source: _____ (separate electric/heat pump/district/oil)
- Circulation pump: _____ (yes/no - check by water heater)
- Main fuse size: _____ A (check your fuse box - important for heat pumps!)

This profile tells you which chapters to focus on:

If you have...	Read these chapters first
Självdreg ventilation	Chapter 9 (Ventilation) - natural section
F-system ventilation	Chapter 9 (Ventilation) - F-system section
Electric water heater	Chapter 6 (Heating)
Oil boiler	Chapter 6 (Heating)

3.7 Checklist

- ☐ Write down your house age (from lagfart)
- ☐ Identify your ventilation type (självdreg / F-system / FTX)
- ☐ Identify your DHW source (electric / oil / district / heat pump)
- ☐ Check if you have a circulation pump (cirkulationspump)
- ☐ Write down your main fuse size
- ☐ Complete the "My House Profile" in this chapter
- ☐ Share your findings with family members

Part II

Major Energy Users

Chapter 4

Power Metering: Know Your Energy Costs

You can't manage what you don't measure. Before investing in upgrades, know exactly what you're paying for each energy source.

This chapter helps you:

- Compare electricity, oil, wood, and district heating on equal terms
- Calculate your actual cost per kilowatt-hour (kWh)
- Identify which energy source is most expensive
- Make informed decisions about upgrades

4.1 Why Cost Per kWh Matters

Different energy sources use different units:

- Electricity: kWh (direct)
- Oil: Liters (needs conversion)
- Wood: Cubic meters or tonnes (needs conversion)
- District heating: kWh or SEK (varies by supplier)

The magic formula: Convert everything to SEK/kWh. Then you can compare apples to apples.

4.2 How to Calculate Your Cost Per kWh

4.2.1 Electricity

Formula:

$$\text{SEK/kWh} = (\text{Total electricity bill including taxes and fees}) \div (\text{Total kWh used})$$

Example:

- Monthly bill: 1,500 SEK (including grid fees, energy tax, VAT)
- Consumption: 1,000 kWh
- Cost per kWh: $1,500 \div 1,000 = 1.50 \text{ SEK/kWh}$

Important: Use your TOTAL bill (including fixed fees, energy tax, grid fee, VAT). Don't just use the "spot price" - that's only part of what you pay.

4.2.2 Oil

Oil is sold by volume (liters). 1 liter of heating oil contains approximately 10.3 kWh of energy.

Formula:

$$\text{SEK/kWh} = (\text{Price per liter}) \div 10.3$$

Example:

- Oil price: 18 SEK/liter
- Energy content: 10.3 kWh/liter
- Cost per kWh: $18 \div 10.3 = 1.75 \text{ SEK/kWh}$

Real oil cost includes: Delivery fees, tank maintenance, annual boiler service (1,500-3,000 SEK/year). Add these to your calculation!

4.2.3 Wood (Bought)

Wood is measured in cubic meters (m³) or tonnes. Energy content varies by wood type and moisture.

	Wood type	kWh/m ³	kWh/tonne	kWh/kg
Typical energy content (dry wood):	Birch (björk)	2,200-2,500	4,000-4,500	4.0-4.5
	Spruce (gran)	1,800-2,200	3,500-4,000	3.5-4.0
	Pine (tall)	1,800-2,200	3,500-4,000	3.5-4.0

Formula:

$$\text{SEK/kWh} = (\text{Price per m}^3 \text{ or tonne}) \div (\text{kWh per m}^3 \text{ or tonne})$$

Example (birch, bought):

- Price: 800 SEK/m³ (delivered, dry)
- Energy content: 2,200 kWh/m³
- Cost per kWh: $800 \div 2,200 = 0.36 \text{ SEK/kWh}$

4.2.4 District Heating (Fjärrvärme)

Formula:

$$\text{SEK/kWh} = (\text{Total annual bill including fixed fees}) \div (\text{Total kWh used})$$

Example:

- Annual bill: 18,000 SEK
- Consumption: 15,000 kWh
- Cost per kWh: $18,000 \div 15,000 = 1.20 \text{ SEK/kWh}$

Different utilities have different pricing structures. Some charge more for peak hours, some have higher fixed fees. Check your specific contract.

4.3 Typical Cost Ranges in Sweden (2024)

Energy source	Typical SEK/kWh	Notes
Electricity (variable price)	1.20-2.00 SEK	Highly variable by season
Electricity (fixed price)	1.50-2.50 SEK	Locked for 1-3 years
Oil	1.60-2.20 SEK	Rising long-term
District heating	0.80-1.40 SEK	Varies by municipality
Wood (bought, dry)	0.30-0.50 SEK	Requires labor
Wood (own forest)	0.40-0.70 SEK	Includes labor value
Heat pump (air/water)	0.40-0.70 SEK	Includes electricity cost
Heat pump (ground source)	0.30-0.50 SEK	Most efficient

Real example - Uppsala 2024:

- Electricity (variable): 1.60 SEK/kWh average
- District heating: 1.10 SEK/kWh
- Oil: 1.90 SEK/kWh
- Wood (bought): 0.45 SEK/kWh (plus labor)

4.4 The "What If" Calculator

Use these numbers to evaluate upgrades:

If you pay 1.80 SEK/kWh for oil:

- Switching to air-to-water heat pump (0.50 SEK/kWh) saves 1.30 SEK/kWh
- For a house using 20,000 kWh/year: **26,000 SEK/year savings**

If you pay 1.60 SEK/kWh for electricity:

- Adding a heat pump (0.50 SEK/kWh) saves 1.10 SEK/kWh
- For 15,000 kWh heating: **16,500 SEK/year savings**

If you pay 0.45 SEK/kWh for wood:

- Switching to heat pump (0.50 SEK/kWh) costs MORE - stick with wood

- True wood cost including other expenses (0.16): $0.47 + 0.16 = 0.63$ SEK/kWh
- Now heat pump may be competitive

4.5 Your Personal Energy Cost Tracker

Fill this out using your actual bills. (See the printable "Energy Cost Tracking" sheet in the Appendix)

Energy source	My cost (SEK/kWh)	Compared to average
Electricity	-----	-----
Oil	-----	-----
District heating	-----	-----
Wood (bought)	-----	-----
Wood (own forest)	-----	-----

4.6 When to Use the Nexus Energy Audit Tool

With the free Nexus Energy Audit Tool, you can:

- **Know your real energy cost** - Compare oil, electricity, wood, and district heating in SEK/kWh
- **See payback periods** - How many years until a heat pump saves you money
- **Calculate savings** - What insulation or new windows will actually save
- **Compare heating options** - Find the cheapest system for YOUR house
- **Make data-driven decisions** - Stop guessing, start saving

Scan the QR code in the appendix to access the free tool. Enter your monthly energy cost from this chapter, and the tool will show you exactly energy cost per kWh and which upgrades make financial sense for YOUR house.

4.7 Key Takeaways

1. **Always convert to SEK/kWh** - the only way to compare different energy sources
2. **Include ALL costs** - taxes, fees, maintenance, delivery, labor
3. **Track over time** - energy prices change; re-calculate annually
4. **Use your actual numbers** - averages don't apply to your specific situation

The bottom line: Knowing your cost per kWh is the single most important number for energy decisions. A resident who knows they pay 1.80 SEK/kWh for oil will switch to a heat pump immediately. A resident who never calculated it will keep paying too much.

Chapter 5

Insulation and Windows That Pay Off

Best long-term investment. Unlike behavioral changes, insulation keeps saving energy year after year.

5.1 Attic Insulation

In most detached houses, the attic is the single largest source of heat loss.

Recommended Thickness:

- Houses built before 1980 often have 100–200mm insulation
- Total insulation thickness of **400–500mm** is recommended today
- Adding insulation on top of existing material is usually sufficient

Common mistakes to avoid:

- Blocking attic ventilation openings
- Compressing insulation (reduces performance)
- Leaving attic hatches uninsulated

✂️**Cost:** 10,000–25,000 SEK (DIY) or 25,000–45,000 SEK (professional). **Payback:** 3–7 years.

5.2 Walls and Floors

Wall insulation makes sense when:

- The facade is already being renovated
- Indoor comfort problems exist (cold surfaces, drafts)
- Energy use is high compared to similar houses

Moisture Risk: Before insulating walls or floors, moisture conditions must be understood. Poorly designed upgrades can cause rot or mold.

5.3 Windows

Often effective alternatives to full replacement:

- Adding an extra inner pane
- Replacing worn seals
- Adjusting or repairing existing frames

Comfort First: Draft-free windows often matter more than very low U-values.

5.4 Moisture Safety

In Sweden, moisture damage from improper insulation is the cause of post-renovation mold. Never skip a moisture survey.

Key principles:

- Never seal moisture inside a cold structure
- Maintain ventilation paths after insulation
- Investigate existing moisture problems before upgrading

5.5 Checklist

- ☐ Measure attic insulation depth (need 400-500mm total)
- ☐ Check attic for roof leaks or moisture before insulating
- ☐ Ensure attic vents are not blocked by insulation
- ☐ Feel walls on cold days - are they cold to touch?
- ☐ Check window seals - do you feel drafts?
- ☐ Inspect basement/crawl space for moisture
- ☐ Get quotes for attic insulation (highest priority)

Chapter 6

Heating Systems Made Simple

Heating is usually the largest part of your energy bill - often 50-70% of total. Getting it right saves more money than any other upgrade.

Efficiency depends more on design than technology. Choosing and operating your heating system wisely gives comfort and long-term savings.

Quick reality check:

- Most Swedish homes use: district heating (cities), heat pumps (suburban), or oil/electric (older rural)
- If you have district heating: You can skip most of this chapter - your focus should be on reducing usage, not changing source
- If you have oil: Read carefully - switching to a heat pump can save 20,000-40,000 SEK/year
- If you have electric heater: A heat pump could cut your bill in half

Not sure what you have? Go back to Chapter 2 (Know Your House) and identify your system first. Then return here.

6.1 How Heat Pumps Work

A heat pump doesn't create heat - it moves heat. Think of it like a refrigerator, but backwards.

6.1.1 Where Does the Heat Come From?

Heat pumps extract heat from natural sources, even in cold weather:

Heat source	How it works
Outdoor air (luft)	Even at -20°C, outdoor air contains heat energy. The heat pump extracts it.
Ground (berg/mark)	A few meters underground, temperature is constant 5-10°C year-round.
Water (sjö/brunn)	Groundwater or lake water stays above freezing.
Exhaust air (frånluft)	The warm air leaving your house (20-22°C) contains heat you already paid for.

Key insight: Cold air still contains heat. At -15°C, a good heat pump can still extract enough heat to warm your house. That's why they work in Sweden.

6.1.2 The Simple Explanation

Think of a heat pump as an "energy elevator":

1. **Collect:** A fan or pipe collects heat from outdoor air, ground, or exhaust air
2. **Concentrate:** A compressor squeezes the heat, making it hotter (like pumping up a bicycle tire - it gets warm)
3. **Deliver:** The concentrated heat is released into your house (through air or water)
4. **Repeat:** The cooled source is released, and the cycle continues

6.1.3 The Efficiency Secret

For every 1 kWh of electricity, a heat pump delivers 3-5 kWh of heat.

Direct electric heater: 1 kWh electricity → 1 kWh heat

Heat pump: 1 kWh electricity → 3-5 kWh heat

That's 300-500% efficiency - which sounds impossible until you understand it's moving heat, not creating it.

6.1.4 The Three Main Types of Heat Pump for Swedish Homes

Now that you understand the principle, here are your options:

- **Air-to-air (luft/luft):** Takes heat from outdoor air, delivers warm air directly into rooms. Quick installation, lower cost. Best for open plan living areas or as supplementary heating.
- **Air-to-water (luft/vatten):** Takes heat from outdoor air, delivers heat to your water-based radiator system. Works with existing radiators or underfloor heating. The most common choice for whole-house heating in Sweden.
- **Ground-source (bergvärme):** Takes heat from the ground via a borehole (100-200 meters deep) or horizontal pipes. Most efficient and most expensive. Best for larger houses (150+ m²) and long-term ownership.

Which is most common in Sweden?

- Air-to-water: Most popular for whole-house heating
- Air-to-air: Most popular for supplementary or smaller homes
- Ground-source: Best efficiency, but requires upfront investment

6.1.5 Do Heat Pumps Work in Swedish Winters?

Yes, but with caveats. Modern heat pumps work well down to -25°C.

Cold climate performance:

- At +7°C: Full efficiency (COP 4-5)
- At -7°C: Reduced efficiency (COP 2.5-3.5)
- At -15°C: Still works (COP 2-2.5)
- At -25°C: May need backup heat (electric heater or wood stove)

What "works" means:

- The heat pump still produces heat, but less efficiently
- Most Swedish homes need a backup heat source for the coldest weeks
- This backup can be: built-in electric heater, wood stove, or old oil boiler

Don't oversize for the coldest week! A heat pump sized for -25°C will be too large for 95% of the year, causing short cycling and lower efficiency. It's better to use backup heat for the 10-20 coldest days per year.

Oversizing is a common mistake. Always get a professional heat load calculation.

6.1.6 Key Terms You'll Hear

COP Coefficient of Performance - Efficiency at a specific temperature. Higher is better. Example: COP 4 at +7°C means 1 kWh electricity → 4 kWh heat.

SPF Seasonal Performance Factor - Average efficiency over an entire year. More important than COP because it accounts for cold weather.

Defrost cycle When ice forms on the outdoor unit, the heat pump briefly reverses to melt it. Normal, but reduces efficiency temporarily.

Short cycling When a heat pump turns on and off too frequently (every 5-10 minutes). Wastes energy and wears out components. Usually caused by oversized system.

Remember: SPF is what matters for your wallet. A heat pump with COP 5 at +7°C but poor cold weather performance may have lower SPF than one with COP 4 but better cold weather operation. Always ask for SPF, not just COP.

Key types:

- **Air-to-air:** Heats air directly. Quick installation, lower cost.
- **Air-to-water:** Feeds radiators or underfloor heating. Works with existing systems.
- **Ground-source (bergvärme):** Highest efficiency, highest cost.

6.2 Choosing the Right System

- **Air-to-air:** Best for smaller or well-insulated homes
- **Air-to-water:** Good for most Swedish houses with radiators
- **Ground-source:** Best for larger houses (150+ m²) with outdoor space

6.3 Oil Boilers: What to Do If You Still Have One

Oil boilers are expensive to run and being phased out. If you still have one, start planning its replacement.

Oil boilers were common in Swedish houses built between 1960 and 1990. While they work, they are now the most expensive heating option.

6.3.1 The Real Cost of Oil Heating

Typical annual oil cost for a 150 m² house:

- Oil consumption: 2,000–3,000 liters/year
- Cost at 15–20 SEK/liter: **30,000–60,000 SEK/year**
- Compare to heat pump: 8,000–15,000 SEK/year
- **You could save 20,000–45,000 SEK/year by switching**

6.3.2 Your Options for Replacing an Oil Boiler

1. **Air-to-water heat pump** (best for most houses) - 80,000-120,000 SEK after RUT
2. **Ground-source heat pump** (if you have space) - 150,000-200,000 SEK
3. **Pellet boiler** (if you want to keep "fire" heating) - 60,000-100,000 SEK
4. **District heating connection** (if available in your area) - varies

Grants for oil boilers: Energimyndigheten offers grants of 20,000–30,000 SEK specifically for replacing oil boilers with heat pumps or biofuel systems. Apply before starting work!

6.3.3 While You Still Have the Oil Boiler

- Get it serviced annually (dirty burners use 10-15% more fuel)
- Consider blending in up to 30% bio-oil (reduces fossil use)
- Lower water temperature from 80°C to 60-65°C if possible
- **Don't invest in a new oil boiler** - they will likely be banned for new installations within 5-10 years

6.4 Wood Stoves and Fireplaces: Supplemental Heating

Wood stoves can save money, but only if you have access to cheap or free firewood.

Many Swedish homes have a wood stove (*vedspis*) or fireplace (*öppen spis*) used for ambiance and supplemental heating.

6.4.1 Pros and Cons of Wood Heating

Pros	Cons
Low-cost	Requires physical work (chopping, stacking)
Independent of electricity prices	Air pollution (fine particles)
Works during power outages	Inefficient if not a modern stove
Creates cozy atmosphere	Needs regular cleaning (chimney sweep)

6.4.2 Getting the Most from Your Wood Stove

Modern stoves are much cleaner and more efficient. An old open fireplace sends 80-90% of heat up the chimney.

If buying a new stove:

- Look for **EEV (EcoDesign Ready)** certification - required for new stoves after 2022
- Efficiency rating: 75-85% (old stoves: 40-60%)
- Small stoves (3-5 kW) are enough for most living rooms
- Cost: 10,000–30,000 SEK installed
- **ROT-avdrag** applies to installation

If you already have a stove:

- Burn **dry wood** (humidity below 20%) - wet wood wastes 30-50% of energy
- Store firewood for at least 1-2 years before burning
- Clean the chimney annually (required by law in Sweden)
- Close the damper when not in use (otherwise warm air escapes)
- Never leave the stove door open - this pulls warm air from your house

Safety First:

- Always use a certified chimney sweep (*sotare*) annually
- Install a carbon monoxide detector
- Never burn treated wood, painted wood, or trash
- Keep flammable materials at least 1 meter from the stove

6.4.3 Wood vs. Heat Pump: A Realistic Comparison

Cost comparison for heating a typical living room (40 m²) through winter:

Heating method	Seasonal cost	Effort level
Wood stove (bought firewood: 800 SEK/m ³)	2,000–4,000 SEK	High
Air-to-air heat pump	600–1,200 SEK	None
Direct electric radiators	2,500–4,000 SEK	None

Conclusion: If you buy firewood, a heat pump is often cheaper. If you have free firewood and enjoy the work, a wood stove makes sense.

6.4.4 Pellet Boilers: The Automatic Wood Heating Option

For Households who want to keep "wood heating" but avoid the physical work:

- Automatic feed from a pellet storage bin
- Efficiency: 80-90% (better than most wood stoves)
- Cost: 60,000–100,000 SEK installed
- Fuel cost: Similar to wood but more convenient
- Requires storage space for pellets (often 2-5 tons/year)

Best for: Rural homes without access to district heating or natural gas, where heat pumps may struggle in extreme cold.

6.5 Realistic Savings

Typical Swedish households can expect:

- Air-to-air heat pump: 20–35% heating reduction
- Air-to-water heat pump: 30–50% heating reduction
- Ground-source heat pump: 50–60% heating reduction
- Oil boiler to heat pump: 50–70% reduction in heating cost
- Wood stove (supplemental): 10–30% reduction if used strategically

Real example - Oil to Heat Pump Conversion:

- Before: 2,500 liters oil/year = 45,000 SEK
- After: Air-to-water heat pump + 500 liters oil backup = 12,000 SEK electricity + 9,000 SEK oil = 21,000 SEK total
- **Annual savings: 24,000 SEK**
- Payback on 120,000 SEK investment: 5 years (with grants)

6.6 Common Mistakes to Avoid

Avoid These Errors:

- **Oversizing:** Leads to short cycles and lower efficiency
- **Poor control settings:** Incorrect curves reduce savings
- **Blocking airflow:** Outdoor units need clearance
- **Neglecting maintenance:** Filter cleaning is essential

6.7 Checklist

- ☐ Identify your heating system type (oil / electric / heat pump / district / wood)
- ☐ Find your main fuse size (look at your fuse box - critical for upgrades!)
- ☐ Calculate your current heating cost per kWh (see Chapter 5)
- ☐ Schedule annual service before winter

If You Have Oil:

- ☐ Check oil price and calculate annual cost
- ☐ Research heat pump replacement grants (Energimyndigheten offers 20,000-30,000 SEK)
- ☐ Get a service quote for your oil boiler (annual maintenance)

If You Have a Heat Pump:

- ☐ Find your system's SPF value (check manual or ask installer)
- ☐ Clean outdoor unit (remove leaves, snow, ice)
- ☐ Check that indoor vents are not blocked by furniture
- ☐ Set heating curve correctly (ask installer if unsure)

If You Have a Wood Stove:

- ☐ Check wood moisture (below 20% - buy a moisture meter)
- ☐ Schedule chimney sweep (required annually by Swedish law)
- ☐ Install carbon monoxide detector
- ☐ Store firewood properly (dry, covered, at least 1-2 years old)

If You Have District Heating (Fjärrvärme):

- ☐ Ask your utility for an itemized bill (separate heating vs DHW)
- ☐ Check if you have individual metering (possible savings)

- ☐ Focus on reducing usage (insulation, behavior) - you can't change source

Planning an Upgrade:

- ☐ Get 3 quotes from different installers
- ☐ Ask each for SPF estimates, not just COP
- ☐ Check main fuse capacity BEFORE buying (Chapter 1)
- ☐ Apply for grants BEFORE signing contract
- ☐ Ask about RUT-avdrag (50% off labor)

Next step: Once you understand your heating system, move to Chapter 7 (Domestic Hot Water) - the second largest energy user in your home.

Chapter 7

Domestic Hot Water (DHW): The Hidden Energy User

Hot water is often 15-25% of your energy bill. Many Households don't realize they can optimize it separately from heating.

7.1 How Does Your House Make Hot Water?

First, identify your system:

You have...	Look for...
Electric water heater	A large tank (50-200 liters) with electrical wires, often in utility room/basement
Oil boiler with coil	The oil boiler heats water on demand (no separate tank)
District heating	A heat exchanger (växlare) with pipes from the street
Heat pump (combined)	The same outdoor unit that heats your house also heats water
Solar thermal	Panels on roof (different from solar PV - these look like black boxes with pipes)

Quick check: Turn on a hot water tap. Does your heating system start running? If yes, they're connected. If not, you have a separate water heater.

7.2 Electric Water Heaters (Elberedare)

Most common in houses without district heating or heat pumps. Also the most expensive to run.

Optimization tips:

1. **Insulate the tank** - Older tanks lose heat constantly. An insulation jacket costs 500-1,000 SEK and pays back in 1-2 years.

2. **Insulate hot water pipes** - Wrap exposed pipes in foam insulation (200-500 SEK). Prevents heat loss before water reaches the tap.
3. **Lower the temperature to 60°C** - Never below 55°C (Legionella risk). Every 5°C lower saves 5-10% energy.
4. **Install a timer** - Heat water only when you need it (morning and evening). Saves 10-20%.
5. **Consider a heat pump water heater** - When your tank fails, replace with a hybrid unit. Saves 50-60% but costs 15,000-25,000 SEK.

Legionella risk: Never set your water heater below 55°C. Bacteria grow in warm water between 25-50°C. 60°C is the safe standard in Sweden.

Savings from electric water heater optimization:

- Insulation jacket + pipe insulation: 500-1,500 SEK investment → 1,000-2,000 SEK/year savings
- Add timer: 500-1,000 SEK → additional 1,000-2,000 SEK/year
- **Total potential savings: 2,000-4,000 SEK/year with minimal investment**

7.3 DHW from Oil Boiler

Inefficient but common in older houses. The boiler runs all summer just to make hot water.

Optimization tips:

1. **Add a hot water tank** - If you don't have one, adding a storage tank allows the boiler to run less frequently.
2. **Lower boiler temperature** - 65-70°C instead of 80°C saves fuel.
3. **Consider electric water heater as backup** - Use electricity for summer hot water, save oil for winter heating.
4. **Plan for replacement** - When the oil boiler fails, replace with air-to-water heat pump or electric water heater.

7.4 DHW from District Heating (Fjärrvärme)

Most efficient option, but you're still paying for it. You can't change the source, but you can reduce usage.

Optimization tips:

1. **Check your heat exchanger** - Scale buildup reduces efficiency. Have it inspected every 5 years.
2. **Lower supply temperature** - If you have control, set to 55-60°C for DHW (not possible in all systems).
3. **Reduce DHW circulation** - If you have a circulation pump, put it on a timer (morning and evening only).

4. **Insulate pipes** - Same as electric water heater system.

Fjärrvärme costs: Your bill likely combines space heating and DHW. Without separate meters, it's hard to know how much hot water costs. Ask your utility for an itemized breakdown.

7.5 DHW from Heat Pump (Combined System)

Most efficient option. Your heat pump makes both space heating and hot water.

Optimization tips:

1. **Check the DHW settings** - Many heat pumps have separate settings for hot water temperature and schedule.
2. **Set DHW to 50-55°C with legionella cycle** - Modern heat pumps have an anti-legionella cycle that heats to 65°C once weekly. This is more efficient than constant 60°C.
3. **Time DHW production** - Set the heat pump to make hot water during daytime (warmer outdoor air = better COP).
4. **Consider a separate water heater** - In summer, a small electric water heater may be more efficient than running the whole heat pump.

Read your heat pump manual! Many Households never adjust DHW settings. You could be saving 10-20% on hot water energy just by changing a setting.

7.6 Solar Thermal (Solfångare) for DHW

Niche but good for summer hot water. Works well in Sweden from April to September.

What you need to know:

- Panels on roof (look different from solar PV - usually black with visible pipes)
- Pre-heats water before it enters your main water heater
- Can cover 50-70% of summer DHW needs, 10-20% of annual total
- Cost: 30,000-60,000 SEK installed
- **Usually not worth it unless you use a LOT of hot water** (large family, pool, etc.)

Solar PV is usually better than solar thermal in Sweden. Unless you have a very large family with high summer hot water demand. PV generates electricity year-round and can power a heat pump or electric water heater. Solar thermal only works well in summer.

7.7 DHW Circulation Pumps (Cirkulationspump)

Biggest hidden energy waste in Swedish houses. In many houses with central hot water systems, circulation pumps run 24/7, even when no one needs hot water.

What it is: A pump that keeps hot water moving through pipes so you get instant hot water at the tap.

The problem: These pumps use electricity AND the pipes lose heat constantly.

Optimization:

1. **Install a timer** - Run the pump only during morning and evening hours (6-9 AM, 4-9 PM). Saves 50-70% energy.
2. **Use a demand-controlled pump** - Runs only when you open a tap (expensive, but saves most).
3. **Turn it off in summer** - Warm water in pipes is less of a comfort issue in summer.
4. **Insulate all hot water pipes** - Especially the circulation loop.

Circulation pump savings:

- 24/7 pump: 200-500 kWh/year (300-800 SEK at 1.5 SEK/kWh)
- With timer: 60-150 kWh/year (90-225 SEK/year)
- Timer cost: 500-1,000 SEK
- **Payback: 1-2 years**

Biggest single DHW saving: Install a timer on your circulation pump. 500-1,000 SEK investment, 1-2 year payback, and you won't notice the difference in comfort.

7.8 Quick DHW Checklist

- ☐ Is your water heater insulated?
- ☐ Are hot water pipes insulated where visible?
- ☐ Do you have a timer on your circulation pump?
- ☐ Is water heater temperature set to 60°C (not higher)?
- ☐ Do you use low-flow shower heads?
- ☐ Are shower times reasonable (under 5 minutes)?

Part III

Electricity Users

Chapter 8

Plugloads: The Hidden Electricity Users

Plugloads are often 10-25% of household electricity. After heating and hot water, this is usually the third largest energy user.

Why plugloads matter:

- Plugloads affect every household, every day
- Most homes can save 500-2,000 SEK/year with simple changes
- Ventilation savings are smaller unless you have FTX
- You can take action on plugloads TODAY

8.1 The Energy Hierarchy in Your Home

Energy User	Typical Share
Space heating	50-70%
Domestic hot water (DHW)	15-25%
Plugloads (appliances, electronics)	10-25%
Ventilation (without heat recovery)	5-10%
Lighting	2-5%

The math: If you spend 20,000 SEK/year on electricity, plugloads cost you 2,000-5,000 SEK/year.

What are plugloads? Any device that plugs into an electrical outlet: appliances, electronics, chargers, entertainment systems, kitchen gadgets.

8.2 The Biggest Energy Users You Might Not Realize

8.2.1 Refrigerators and Freezers

Your fridge runs 24/7/365. A 15-year-old fridge uses 2-3x more electricity than a new one.

Typical consumption:

- New (A+++): 100-200 kWh/year → 150-300 SEK/year
- 10-15 years old: 300-500 kWh/year → 450-750 SEK/year
- 20+ years old: 500-800 kWh/year → 750-1,200 SEK/year

Optimization tips:

1. Clean the coils on the back every 6 months (dust makes them work harder)
2. Check door seals: Close a banknote in the door - if you can pull it out easily, replace seals
3. Set temperature: Fridge 4-5°C, Freezer -18°C (colder wastes energy)
4. Don't overfill (blocks air circulation) or underfill (too much empty space to cool)
5. **Consider replacing if over 15 years old** - a new fridge pays for itself in 5-8 years

8.2.2 Second Fridge/Freezer in the Garage

This is one of the biggest hidden energy wastes in Swedish homes. A second fridge or freezer in an unheated garage runs inefficiently, especially in winter.

The problem:

- In winter (0°C or below), the fridge doesn't need to run - but it doesn't know that
- The compressor may run unnecessarily, or worse, the freezer may stop working properly
- In summer (20-30°C), the fridge works much harder than indoors

What to do:

1. **Unplug it** if you're storing almost nothing
2. **Replace with a "garage-ready" model** designed for temperature swings (common in Sweden)
3. **Move it indoors** if you have space
4. **Test it:** Put a thermometer inside. If temperature fluctuates more than 5°C, it's wasting energy

Second fridge savings: Unplugging an old garage fridge can save 500-1,000 SEK/year.

8.2.3 Gaming Computers and Consoles

A gaming PC can use more electricity than a new refrigerator. Especially if left on 24/7.

Typical consumption:

Device	Idle (W)	Gaming (W)	Yearly cost (4 hrs/day)
Gaming PC + monitor	80-150W	300-600W	800-1,800 SEK
Laptop	15-30W	60-120W	150-350 SEK
PlayStation/Xbox	30-50W	150-200W	350-500 SEK
Nintendo Switch	5-10W	10-20W	50-100 SEK

Optimization tips:

1. **Enable sleep mode** after 30 minutes of inactivity
2. **Don't leave games running in the background** - pause and minimize
3. **Turn off monitors** when not in use (they draw power even in sleep)
4. **Use a power strip with switch** for whole setup
5. **Consider a laptop instead of desktop** for non-gaming family members

Gaming PC always on? A gaming PC left on 24/7 can cost 1,000-2,000 SEK/year in electricity. That's 10-20% of some households' total electricity bill!

8.2.4 Network Equipment and Smart Home Devices

Always-on devices add up silently. Most homes have 10-20 devices drawing power 24/7.

Typical always-on loads:

Device	Typical Watts	Yearly cost (1.5 SEK/kWh)
Router (Broadband)	5-15W	65-200 SEK
Switch/access point	3-10W	40-130 SEK
NAS (network storage)	15-40W	200-525 SEK
Smart speakers (each)	2-5W	25-65 SEK
Smart home hub	2-5W	25-65 SEK
Doorbell camera	3-8W	40-105 SEK

Total typical: 50-150W continuously → 650-2,000 SEK/year just for network and smart devices!

Optimization tips:

1. **Use a timer for non-critical devices** (smart speakers don't need to listen at 3 AM)
2. **Consolidate devices** - one good router instead of router+switch+access point
3. **Unplug old routers** when you upgrade (many people keep old ones plugged in)
4. **Check if your NAS can sleep** when not in use

8.2.5 Kitchen Gadgets That Never Turn Off

Coffee makers, microwaves, and other kitchen gadgets draw power 24/7 for clocks and standby.

Typical standby power:

Device	Standby (W)	Yearly cost
Coffee maker (with clock)	1-3W	15-40 SEK
Microwave (with clock)	2-4W	25-50 SEK
TV (standby)	1-5W	15-65 SEK
Soundbar (standby)	2-8W	25-105 SEK
DVD/Blu-ray player	1-3W	15-40 SEK

Total for 5-10 gadgets: 10-30W always-on → 130-400 SEK/year

Optimization tips:

1. Use a **power strip with switch** for entertainment center
2. **Unplug the coffee maker** after morning coffee (or use a mechanical timer switch)
3. **Don't leave phone chargers plugged in** without a phone (they still draw 0.1-0.5W)

8.3 The Power Strip Strategy

One power strip with a switch is the simplest plugload solution. One click turns off 5-10 devices.

Where to put power strips:

- Entertainment center (TV, soundbar, game console, streaming box)
- Computer desk (monitor, speakers, printer, phone charger)
- Kitchen counter (coffee maker, microwave, toaster)
- Home office (router, extra monitor, desk lamp)

Example savings from one power strip:

- TV + soundbar + game console + streaming box standby: 10-20W
- Turned off when not in use: saves 80-160 kWh/year
- Cost of power strip: 50-150 SEK
- **Payback: 1-3 months**

8.4 Measure Before You Change

Most Households have no idea which devices cost them the most. A simple plug-in energy meter (energimätare) costs 200-400 SEK and pays for itself immediately.

What to measure:

1. Your refrigerator/freezer (measure for 24 hours)
2. Your gaming PC during gaming (1 hour)
3. Your entertainment center in standby (measure for 24 hours)
4. Your second fridge if you have one

8.5 When to Replace vs. Keep

Device	Replace if...
Refrigerator/freezer	Over 15 years old
Gaming PC	Old power supply (inefficient)
Router	Over 5 years old (newer are more efficient)
Phone charger	Old "wall wart" type (new USB-C are more efficient)

Remember: The most efficient device is the one that's turned off. Before buying anything new, try turning things off first.

Have solar panels? Try to run your dishwasher, washing machine, or charge your EV during sunny hours (10 AM – 3 PM). This maximizes the free energy you generate and reduces reliance on the grid. See Chapter 11 for more solar tips.

8.6 Checklist

- ☐ Walk through your house and count plugged-in devices
- ☐ Unplug one device you haven't used in the last month
- ☐ Turn off your gaming PC when not gaming (not sleep mode)
- ☐ Unplug phone chargers without a phone connected
- ☐ Close the refrigerator door properly (check the seal)

This Week (0-500 SEK):

- ☐ Clean dust off the back of your refrigerator coils
- ☐ Check fridge door seals (close a banknote - can you pull it out?)
- ☐ Set fridge to 4-5°C, freezer to -18°C (not colder)
- ☐ Enable sleep mode on your computer (30 minutes)
- ☐ Buy a power strip with switch (50-150 SEK) for entertainment center
- ☐ Buy a plug-in energy meter (200-400 SEK) from Clas Ohlson or Kjell

Second Fridge/Freezer Check (If You Have One):

- ☐ Do you REALLY need a second fridge/freezer?
- ☐ What's actually inside it? (If mostly empty, unplug it!)
- ☐ Is it in an unheated garage? (Very inefficient)
- ☐ How old is it? (Over 15 years = replacement pays back in 3-5 years)

Gaming Computer Check:

- ☐ Measure your gaming PC's power consumption (1 hour of gaming)
- ☐ Enable sleep mode after 30 minutes inactivity
- ☐ Turn off monitors when not in use

- ☐ Don't leave games running in the background

Network and Smart Devices:

- ☐ Check how many devices are always on (router, smart speakers, etc.)
- ☐ Unplug old router if you upgraded (many people keep them plugged in)
- ☐ Put smart speakers on a timer (they don't need to listen at 3 AM)

Track Your Savings:

- ☐ Measure your refrigerator's 24-hour consumption
- ☐ Identify your top 3 energy users
- ☐ Calculate your potential yearly savings (use table in this chapter)

Remember: The most efficient device is the one that's turned off. Before buying anything new, try turning things off first.

Chapter 9

Lighting: The Easiest Energy Save

Lighting is 5-15% of household electricity. In Swedish winters, with fewer daylight hours, it can be even higher.

The good news: LED lighting is now cheap, readily available, and pays back faster than almost any other energy upgrade.

9.1 LED vs. Old Technology

Bulb type	Watts (same brightness)	Lifespan (hours)	Years of use*
Incandescent (glödlampa)	60W	1,000	1 year
Halogen	42W	2,000	2 years
CFL (lågenergi)	14W	8,000	8 years
LED	8W	25,000	25 years

*Based on 3 hours/day use

Cost comparison for one bulb (3 hours/day, 1.5 SEK/kWh):

Bulb type	Yearly electricity cost	Bulb cost	Total yearly
Incandescent	98 SEK	10 SEK	108 SEK
LED	13 SEK	30 SEK	43 SEK

Savings per bulb: 65 SEK/year. A house with 20 bulbs saves 1,300 SEK/year.

9.2 Where to Start

Replace the bulbs that burn the most hours first. Don't replace all at once - do it gradually.

Priority order:

1. **Living room ceiling lights** (most used)
2. **Kitchen lights** (used daily)
3. **Bedroom lights**
4. **Hallway and staircase** (often left on)
5. **Outdoor lights** (may need cold-rated LEDs)
6. **Basement/garage** (least priority)

9.3 Choosing the Right LED

Term on box	What it means
2700K	Warm white (like old bulbs) - best for living rooms, bedrooms
3000K	Soft white - good for kitchens, bathrooms
4000K	Cool white - good for garages, basements, home offices
lumen (lm)	Brightness - higher = brighter
lm/W	Efficiency - higher = better (good LEDs are 100+ lm/W)

Swedish recommendation: Use 2700K (warm white) for most indoor rooms. The cosy "mysigt" feeling matters, and warm light is less harsh on the eyes during dark winters.

9.4 What to Look For When Buying

- **Energy class:** A++ or A (new EU labels)
- **Warranty:** Good LEDs have 3-5 year warranty
- **Dimmable:** If you have a dimmer switch, buy dimmable LEDs
- **Cold-rated:** For outdoor use in Swedish winters (look for -25°C rating)
- **Retrofit:** Most LEDs fit standard sockets (E27 or GU10 are most common in Sweden)

Don't buy the cheapest LEDs. Cheap LEDs often fail early, have poor color quality, or flicker. Spend 30-60 SEK per bulb for good quality.

9.5 Smart Lighting: Worth It?

Smart bulbs are cool, but rarely pay back financially. They cost 5-10x more than regular LEDs.

When smart lighting makes sense:

- You forget to turn off lights (use timers or motion sensors)
- You want different color temperatures for different times of day
- You have mobility issues (voice control is helpful)
- You just enjoy the technology (it's okay to spend on enjoyment!)

When it doesn't:

- You just want to save energy (regular LEDs + turning off lights is cheaper)
- You have many bulbs (smart bulbs get expensive fast)

Alternative: Smart plugs with timers (50-150 SEK each) can control existing lamps without buying smart bulbs.

9.6 Outdoor Lighting in Swedish Winters

Not all LEDs work in Swedish winter cold. Standard LEDs may flicker or fail below -10°C. Look for the temperature rating on the box. If it says '-20°C', it's safe for Swedish winters. If it doesn't say, assume it's for indoor use only.

What to look for:

- "Utomhus" or "outdoor rated" on the package
- Operating temperature down to -25°C or lower
- IP44 rating or higher (water/dust protection)

9.7 Lighting Habits That Save Money

- ☐ Turn off lights when leaving a room (even for 5 minutes)
- ☐ Use task lighting (desk lamp) instead of ceiling lights when possible
- ☐ Clean lampshades and bulbs (dust blocks 10-20% of light)
- ☐ Use lighter paint colors on walls (reflects light, reduces need for bright bulbs)
- ☐ Take advantage of daylight - open curtains during winter days
- ☐ Use motion sensors for outdoor lights (instead of leaving them on all night)
- ☐ Put outdoor lights on a timer (on at dusk, off at 11 PM or sunrise)

9.8 Quick Lighting Savings Summary

One Swedish home example (120 m²):

Action	Yearly savings
Replace 15 most-used bulbs with LED	800-1,200 SEK
Turn off lights when leaving rooms	200-400 SEK
Put outdoor lights on timer	100-200 SEK
Clean lampshades (free!)	50-100 SEK

Total potential savings: 1,150-1,900 SEK/year

Investment: 300-600 SEK for bulbs. Payback: 3-6 months.

The bottom line: Lighting is the easiest energy upgrade in your home. No tools, no professionals, no waiting. Buy a few LED bulbs this week and start saving immediately.

9.9 Checklist

- ☐ Count how many light bulbs are in your home
- ☐ Identify the 5 bulbs that burn the most hours (living room, kitchen, bedroom)
- ☐ Replace your most-used bulb with LED (50-100 SEK)
- ☐ Turn off lights when leaving a room (even for 5 minutes!)
- ☐ Clean dusty lampshades and bulbs (dust blocks 10-20% of light)

This Week:

- ☐ Replace the next 4 most-used bulbs with LED
- ☐ Check which bulbs are dimmable if you have dimmer switches
- ☐ For outdoor lights: Check if they are cold-rated (-25°C)
- ☐ Put outdoor lights on a timer (on at dusk, off at 11 PM)
- ☐ Consider motion sensors for outdoor security lights

Smart Lighting (Optional):

- ☐ Do you really need smart bulbs? (Regular LEDs + timer is cheaper)
- ☐ Consider smart plugs with timers (50-150 SEK) instead of smart bulbs
- ☐ Only buy smart bulbs for lamps you actually want to control remotely

Seasonal Check:

- ☐ Winter: Use timers for Christmas lights
- ☐ Spring: Clean windows to let in more natural light
- ☐ Summer: Open curtains, use daylight instead of bulbs
- ☐ Autumn: Check outdoor lights before dark season

Color Temperature Check (Swedish recommendation):

- ☐ Living rooms and bedrooms: 2700K (warm white, "mysigt")
- ☐ Kitchens and bathrooms: 3000K (soft white)
- ☐ Garages and basements: 4000K (cool white)
- ☐ Outdoor: 2700-3000K (warm light is less disturbing to wildlife)

Don't throw away working bulbs! Replace gradually as bulbs burn out. Use old bulbs in less-used areas (basement, garage, storage).

Chapter 10

Ventilation and Indoor Comfort

Comfort, health, and energy must go together. Proper ventilation keeps air fresh, reduces moisture, and protects your house from mold.

10.1 Why Ventilation Matters

Poor ventilation can lead to:

- High humidity, condensation on windows
- Musty smells and poor air quality
- Mold growth on walls and ceilings

The Golden Rule: Balanced ventilation = good air quality with minimal energy loss.

10.2 What Ventilation System Do You Have?

Most Swedish houses have NO heat recovery. That's normal and okay. This section helps you understand what you have and what to do about it.

10.2.1 The Three Main Ventilation Types in Sweden

Type	How to Identify	Typical for houses from
Självdtag (Natural)	Vents in walls, no fans, no ducts	Pre-1960, 1960s
F-system (Exhaust-only)	Small fans in kitchen/bathroom, vents in walls for fresh air	1970s, 1980s
FTX (Balanced with heat recovery)	Ducts to all rooms, a central unit with filters, two fans	2000s onward, retrofitted

10.2.2 Självdtag (Natural Ventilation)

If you have this: Your house "breathes" through wall vents, window gaps, and chimney drafts. No fans, no electricity.

How it works:

- Air moves naturally due to temperature differences (warm air rises, cold air sinks)

- Fresh air enters through wall vents (friskluftsventiler)
- Stale air exits through ceiling vents, chimneys, or roof vents
- Works best in winter (big temperature difference), worst in summer

	Pros	Cons
Pros and Cons:	No electricity cost	Uncontrolled - depends on weather
	No maintenance	Drafty in winter
	Simple, no moving parts	Poor air quality in mild weather
	<i>Can work well</i> in leaky older houses	No heat recovery (all heat escapes)

What you can do to improve natural ventilation:

1. **Clean the vents** - Wall vents get clogged with dust and paint
2. **Don't seal all drafts** - Natural ventilation *needs* some air leakage
3. **Ensure vents are open** - Many Households unknowingly close them
4. **Use kitchen/bathroom fans** - Create pressure difference to pull fresh air
5. **Consider adding an exhaust fan** - Upgrading to F-system is relatively cheap

Common mistake: Over-sealing a naturally ventilated house can cause humidity problems and mold. Do NOT seal all drafts if you have självdrag. Leave the wall vents open!

10.2.3 F-system (Exhaust-only Ventilation)

If you have F-system: Fans pull air out of bathrooms and kitchen. Fresh air enters through wall vents (like självdrag). This is the most common system in 1970s-1990s Swedish houses.

How to identify F-system:

- Small fan grilles in bathroom ceiling or wall
- Kitchen exhaust fan (often above the stove)
- Fresh air vents (friskluftsventiler) in bedrooms and living rooms
- **No ducts from living rooms** - air moves through cracks and open doors

	Pros	Cons
Pros and Cons:	Better control than natural	Still no heat recovery
	Relatively simple and reliable	Can create negative pressure
	Lower cost than FTX	May pull in cold air through cracks
	Easy to maintain	Not suitable for very tight houses

Improving your F-system:

1. **Clean fans and ducts** - Clogged fans move less air, run longer, waste electricity
2. **Replace old fans** - Newer EC-motor fans use 50-70% less electricity
3. **Check that fresh air vents are open** - Many are painted shut!
4. **Install a timer or humidity sensor** - Run fans only when needed, not 24/7
5. **Consider demand-controlled ventilation** - Fans that speed up when showering

Upgrade path from F-system:

- **Step 1 (low budget):** Clean system, add timers → 500-2,000 SEK
- **Step 2 (medium budget):** Replace old fans with efficient EC-motor fans → 3,000-8,000 SEK
- **Step 3 (major investment):** Add a frånluftsvärmepump (exhaust air heat pump) → 40,000-70,000 SEK
- **Step 4 (full renovation):** Convert to FTX → 80,000-150,000 SEK

10.2.4 Frånluftsvärmepump (Exhaust Air Heat Pump) - The "Hidden" Upgrade

Best kept secret in Swedish energy efficiency. If you have F-system, you can add a heat pump that captures heat from the exhaust air before it leaves your house.

How it works:

- Installed in the exhaust air duct (before the air exits)
- Captures heat from outgoing air (20-22°C) and uses it to:
 - Heat your domestic hot water
 - Pre-heat fresh air (if connected)
 - Supplement radiator heating
- You keep your existing F-system - just add the heat pump

Pros:

- Lower cost than FTX (40,000-70,000 SEK vs. 80,000-150,000 SEK)
- No new ductwork needed
- Provides hot water heating (saves even more)
- Works well in Swedish climate
- Qualifies for Energimyndigheten grant

Cons:

- Less heat recovery than FTX (40-60% vs. 75-90%)
- Still relies on some fresh air vents
- Not suitable for very tight houses

Financial support (bidrag) for exhaust air heat pumps: Energimyndigheten offers grants of 10,000-20,000 SEK for installing frånluftsvärmepump in houses with existing F-system. Always check current rules at energimyndigheten.se.

10.2.5 FTX Explained

FTX (mechanical ventilation with heat recovery) brings in fresh air while recovering heat from outgoing air. Typical efficiency: 75–90%.

10.2.6 Should You Upgrade to FTX?

FTX is great, but not always worth the cost. Here's when to consider it.

FTX makes sense if:

- You are already doing major renovation (walls and ceilings open)
- Your house is already very airtight (after insulation upgrades)
- You have persistent humidity/mold problems
- You have asthma or allergies (better filtration)
- You plan to live in the house for 15+ years

FTX is probably NOT worth it if:

- Your house is leaky (självdrag works fine)
- You have a well-functioning F-system + exhaust air heat pump
- You are on a tight budget
- You plan to move within 5-7 years

10.2.7 Maintenance

- **Check Filters:** Check and clean filters. Dirty filters reduce airflow by 50%. **every 3 months**
- **Balance:** If one room feels stuffy, the dampers might be unbalanced.
- **Heat Exchanger:** If you see frost or ice inside the unit, the heat exchanger is frozen (usually due to a dirty filter or broken bypass).
- **professional Inspection:** Schedule professional inspection every 2–3 years

Cost comparison: Upgrade paths from F-system (120 m² house):

Upgrade	Cost after grants	Savings/year	Payback
Clean + timers only	500-2,000 SEK	500-1,000 SEK	1-2 years
Replace fans (EC-motor)	3,000-8,000 SEK	1,000-2,000 SEK	3-5 years
Exhaust air heat pump	30,000-50,000 SEK	4,000-7,000 SEK	6-10 years
Full FTX	80,000-120,000 SEK	6,000-10,000 SEK	10-15 years

Conclusion: Start with cleaning and timers. Then consider exhaust air heat pump. Only go to FTX if you're already renovating.

10.3 Checklist

- ☐ Identify your ventilation type (självdreg / F-system / FTX)
- ☐ Clean all vents (friskluftsventiler and exhaust grilles)
- ☐ Check that vents are not painted shut
- ☐ If F-system: Clean fans, consider timer for circulation
- ☐ If FTX: Change filters (every 3 months)
- ☐ Test airflow with tissue paper near vents
- ☐ Check for window condensation (sign of poor ventilation)
- ☐ Schedule professional inspection (every 2-3 years for FTX)

Part IV

Optimization & Production

Chapter 11

Smart Control and Solar PV

Optional but valuable upgrades. These measures are not essential, but when used correctly, they often pay off over time.

11.1 Heating Curves

Properly tuned heating curves maintain comfort while saving energy. A small change can save 5–10% of heating energy.

What is a heating curve? It's a setting in your heat pump or boiler that decides how hot the water should be based on how cold it is outside.

11.1.1 The Simple Explanation

Your heating system doesn't know if it's -10°C or +5°C outside unless you tell it. The heating curve is that instruction.

Outside temperature	What the system does
Warmer outside (+5°C to +15°C)	Sends cooler water to radiators (35-40°C)
Colder outside (-10°C to -20°C)	Sends hotter water to radiators (50-65°C)

Why this matters: If the curve is set wrong, your house overheats on mild days (wasting energy) or underheats on cold days (uncomfortable).

11.1.2 Where to Find Your Heating Curve

- **Heat pumps:** In the control panel menu (look for "heating curve," "värmekurva," or a graph symbol)
- **Oil/electric boilers:** Often controlled by an outdoor sensor (called "utegivare" or "framledningsgivare")
- **District heating:** Usually set by the utility - you cannot adjust it

Can't find it? Search Internet for your brand + "värmekurva" or ask your installer. Many Households never touch this setting - and miss out on 5-10% savings.

11.1.3 What a Heating Curve Looks Like

Most systems show a graph or a number:

What you might see	What it means
A graph (temperature vs. temperature)	Steeper line = hotter water when cold outside
A number like "1.2" or "0.8"	Common in Scandinavian heat pumps (NIBE, CTC, Thermia)
Two numbers like "35/45"	Supply temperature at +20°C outside and -20°C outside

11.1.4 How to Check if Your Curve is Wrong

Signs of a poorly tuned curve:

- House feels too warm on mild days (above 0°C) but fine on cold days → Curve too steep
- House struggles to reach temperature on cold days but fine on mild days → Curve too shallow
- Radiators are cold when it's -5°C outside but warm when it's -15°C → Something is reversed
- Temperature swings throughout the day (too hot, then too cold) → Curve may be wrong or system is short-cycling

Don't guess! Make small changes (one step at a time) and wait 24 hours to see the effect. A wrong adjustment can make your house cold or waste significant energy.

11.1.5 How to Adjust (Without Breaking Things)

Step-by-step for most Swedish heat pumps:

1. Find the heating curve setting in your control panel
2. Write down the current value (take a photo!)
3. If you have a number like "1.2":
 - Lower by 0.1 if house overheats on mild days
 - Raise by 0.1 if house is cold on cold days
4. If you have a graph: Look for "parallel shift" or "offset" - move the line down slightly for less heat, up for more
5. Wait 24-48 hours before making another change
6. Keep a log of changes and results

The "one week test": If you're unsure, leave the curve where it is for one week. Then lower it slightly. If you're still comfortable after 2-3 days, you just saved energy. If you get cold, change it back.

11.1.6 What "A Small Change" Means

Many guides say "a small change saves 5-10%" - here's what that actually means:

If your setting is...	A small change is...
A number (e.g., 1.2)	Change by 0.1 (not 0.5!)
A graph	Move the line down by 2-3°C at most
Temperature numbers (e.g., 35/45)	Lower both numbers by 2-3°C

11.1.7 When to Call a Professional

- You cannot find the heating curve setting
- You made changes and nothing happened (sensor may be broken)
- You have a complex system with multiple zones
- You have district heating (curves are usually not adjustable)

Real example - Stockholm house:

- Before: Heating curve set to 1.4 (factory default)
- After: Adjusted to 1.2 (lowered by 0.2)
- Result: Same comfort, 8% lower heating bill → 2,000 SEK/year saved
- Cost: 0 SEK (just time to adjust)

The bottom line: A properly tuned heating curve is free money. It costs nothing, takes 5 minutes to adjust, and can save hundreds of SEK per year. Most Swedish homes have never had their curve adjusted from factory settings - and they're wasting energy because of it.

11.2 Smart Thermostats

Once your heating curve is correct, smart thermostats are the next step for fine-tuning room-by-room comfort.

Heating curve first, smart thermostats second. A smart thermostat can't fix a badly tuned heating curve. Do the free adjustment first, then consider adding smart controls.

Benefits:

- Lower heating when nobody is home
- Room-by-room scheduling
- Track energy use

11.3 Solar PV Basics

Realistic Expectations: Even a small PV system (3–5 kW) can help. Winter production is limited — don't expect solar to heat your house in December.

Typical production in Sweden:

- Southern Sweden: 900–1,100 kWh per installed kW
- Central Sweden: 850–1,000 kWh per installed kW
- Northern Sweden: 800–950 kWh per installed kW

11.4 Using Your Solar Power Wisely

Shift your energy use to sunny hours. If you have solar panels, run high-consumption appliances when the sun is shining.

Best times: 10 AM – 3 PM (peak solar production)

What to shift:

- Dishwasher
- Washing machine and dryer
- Electric vehicle (EV) charging
- Water heater (if electric)
- Pool pump (if applicable)

Why it matters: Every kWh you use directly from your solar panels saves you the grid electricity price (1.20-2.00 SEK/kWh). If you use the same kWh in the evening, you buy it back at full price.

Example savings for a typical Swedish house:

- Dishwasher cycle during sunny hours: saves 2-3 SEK per cycle
- EV charging (10 kWh) during sunny hours: saves 12-20 SEK per charge
- Washing machine + dryer: saves 4-6 SEK per load
- **Potential monthly savings: 200-500 SEK**

Automate it! Many modern appliances have delay start functions. Set your dishwasher to start at 11 AM before you leave for work. Some EV chargers can be programmed to charge only during sunny hours.

11.5 System Integration

Combine smart controls, heat pumps, and PV to maximize savings. Time heat pump operation to coincide with PV production.

Part V

From Knowledge to Action

Chapter 12

Upgrade Plans by Budget

Start small, improve step by step. You don't have to do everything at once.

12.1 One-Day Improvements (0–500 SEK)

🔧 **Savings:** 5–10%.

- Lower indoor temperature by 1°C
- Remove furniture blocking radiators
- Close doors to unused rooms
- Reduce shower time by 2 minutes

12.2 Low Budget (500–5,000 SEK)

🔧 **Payback:** 6–18 months. **Savings:** 10–20%.

- Draft sealing kit: 200–500 SEK
- Low-flow shower head: 300–800 SEK
- Pipe insulation: 200–500 SEK
- Radiator reflector foil: 300–600 SEK
- Circulation pump timer: 500–1,500 SEK

12.3 Medium Budget (5,000–50,000 SEK)

🔧 **Payback:** 3–8 years. **Savings:** 20–40%.

- Attic insulation to 400–500mm: 10,000–25,000 SEK
- Air-to-air heat pump: 15,000–30,000 SEK
- Air-to-water heat pump: 40,000–70,000 SEK after RUT
- Replace worst windows: 15,000–35,000 SEK after RUT

12.4 Major Renovations (50,000–250,000+ SEK)

🔧 **Payback:** 7–20 years. **Savings:** 40–70%.

- Ground-source heat pump: 140,000–200,000 SEK

- Complete FTX ventilation: 80,000–150,000 SEK
- Full window replacement: 80,000–200,000 SEK
- Solar PV system: 70,000–140,000 SEK

12.5 Subsidies and Tax Deductions

Making It Affordable: The Swedish state often pays for half the labor.

12.5.1 RUT-avdrag

50% deduction on labor costs for most energy upgrades. The installer deducts this directly. Annual limit: 75,000 SEK per person.

12.5.2 ROT-avdrag

30% off labor for structural work during larger renovations.

12.5.3 State Grants from Energimyndigheten

- Heat pumps: Often 10,000–30,000 SEK
- FTX ventilation: 15,000–30,000 SEK
- Solar PV: 15–20% of cost, max 50,000 SEK

How to Apply:

1. Check current grant availability *before* buying
2. Apply *before* signing a contract
3. Save all receipts

12.5.4 Worked Example: Air-to-Water Heat Pump

Item	Cost
Heat pump equipment	45,000 SEK
Installation labor	30,000 SEK
Materials	10,000 SEK
Total invoice	85,000 SEK
Less RUT (50% of labor)	-15,000 SEK
Less Energimyndigheten grant	-10,000 SEK
Final out-of-pocket	60,000 SEK

Annual heating savings: 8,000–12,000 SEK. **Payback: 5–7.5 years.**

Chapter 13

Real Examples

Real houses, real outcomes. All numbers are typical for Swedish conditions.

13.1 1970s Detached House (120 m², Uppland)

Before: Built 1975, direct electric, natural ventilation. Attic: 120mm insulation. Windows: Original double-pane. Annual use: 21,000 kWh. Cost: 25,200 SEK/year.

Step 1: Quick wins (1,200 SEK) → 18,500 kWh/year. Savings: 3,000 SEK/year.

Step 2: Attic insulation + timer (12,000 SEK DIY) → 14,500 kWh/year. Savings: 7,800 SEK/year.

Step 3: Heat pump + 3 windows (55,000 SEK after RUT) → 9,500 kWh/year. Total savings: 13,800 SEK/year.

✂️ **Total investment:** 68,200 SEK. **Payback:** 4.9 years.

13.2 1980s Radhus (85 m², Västra Götaland)

Before: District heating, 12,000 kWh/year. Problem: Temperature swings.

Measures (2,800 SEK): New TRVs, radiator balancing, attic insulation.

Result: 8,500 kWh/year. Savings: 3,150 SEK/year. **Payback:** 11 months.

13.3 Newer House (140 m², Skåne)

Before: Ground-source heat pump, FTX, 14,000 kWh/year. Problem: Higher bills than neighbors.

Diagnosis: Clogged FTX filters, incorrect heating curve.

Fixes (0–500 SEK): Cleaned filters, adjusted heating curve.

Result: 11,000 kWh/year. Savings: 3,600 SEK/year. **Payback:** Immediate.

Chapter 14

Complete Checklists - Quick Reference

Print this chapter and keep it near your fuse box. These are condensed reminders. For detailed instructions, see each chapter.

14.1 Seasonal Maintenance Calendar

Season	Tasks
Winter (Dec-Feb)	- Check radiator balance monthly - Keep vents clear of snow/ice - Clean FTX filters monthly - Never set temperature below 16°C
Spring (Mar-May)	- Clean heat pump outdoor unit - Inspect roof for winter damage - Clean windows and check seals - Schedule annual heating service
Summer (Jun-Aug)	- Clean solar PV panels if dusty - Monitor indoor humidity (i60%) - Turn off circulation pump if rarely used - Clean refrigerator coils
Autumn (Sep-Nov)	- Test heating system before first freeze - Replace all ventilation filters - Schedule chimney sweep - Check attic insulation before winter

14.2 Annual Service Schedule

Month	Task
January	Check radiator balance
February	Clean FTX filters
March	Schedule heat pump service
April	Clean outdoor unit
May	Inspect attic insulation
June	Clean refrigerator coils
July	Check window seals
August	Order heating oil (if applicable)
September	Test heating system
October	Replace ventilation filters
November	Schedule chimney sweep
December	Check weatherstripping

14.3 Pre-Winter Checklist (September)

- ☐ Test heating system (turn it on before you need it!)
- ☐ Replace all ventilation filters
- ☐ Check attic insulation depth (need 400-500mm total)
- ☐ Seal drafts around doors and windows
- ☐ Clean gutters and downspouts
- ☐ Schedule chimney sweep (if you have wood stove)
- ☐ Order heating oil/pellets (prices rise in winter)
- ☐ Program thermostat for winter schedule
- ☐ Check that outdoor heat pump unit is clear

14.4 Quick Troubleshooting

Problem	What to check first
Cold radiators	Air in system? Try bleeding
Heat pump not heating	Ice on outdoor unit? Defrost cycle normal
High electricity bill	Check second fridge, gaming PC, circulation pump
Condensation on windows	Too much humidity? Check ventilation
Musty smell	Clean vents, check for mold. If you see black mold spots, DO NOT scrub them. This releases toxic spores. Contact a professional for remediation
Fuse trips often	Main fuse too small? (need 20-25A for heat pump)

14.5 Complete Installer Questions

Take this list with you. Before signing any contract, ask every potential installer these questions.

- ☐ "How did you calculate the size for my house?"
- ☐ "Can you provide references from similar houses?"
- ☐ "What is the total fixed price including everything?"
- ☐ "Do you handle grant applications or do I?"
- ☐ "What warranty do you offer on parts and labor?"

14.6 My Savings Tracker

Fill this out as you complete upgrades:

Upgrade	Cost	Annual saving
Attic insulation	_____ SEK	_____ SEK
LED bulbs	_____ SEK	_____ SEK
Heat pump	_____ SEK	_____ SEK
Draft sealing	_____ SEK	_____ SEK
Power strips	_____ SEK	_____ SEK

Total invested: _____ SEK **Total annual savings:** _____ SEK

Appendix A

Glossary of Terms

COP	Coefficient of Performance — Instant efficiency of a heat pump
Graddagar	Degree days — measure of heating demand
ROT-avdrag	Tax deduction for renovations (30% off labor)
RUT-avdrag	Tax deduction for household services (50% off labor)
SPF	Seasonal Performance Factor — average annual efficiency
TRV	Thermostatic radiator valve
U-value	Thermal transmittance — lower is better
DHW	Domestic hot water - varmvatten för hushåll
Elberedare	Electric water heater - separate tank for hot water
Cirkulationspump	Circulation pump - keeps hot water moving in pipes
Legionella	Bacteria that grows in warm water (25-50°C), prevented by 60°C storage
Solfångare	Solar thermal panels - heat water directly (not solar PV)
Växlare	Heat exchanger - transfers heat between systems without mixing water
Självdrag	Natural ventilation - air moves without fans
F-system	Exhaust-only ventilation - fans pull air out, fresh air enters through wall vents
Frånluftsvärmepump	Exhaust air heat pump - captures heat from outgoing air
FTX	Mechanical ventilation with heat recovery (Balanced system). Best efficiency but most expensive
Friskluftsventil	Fresh air vent - usually located in walls or windows
lumen	Measure of brightness - higher = brighter light
Kelvin (K)	Color temperature - lower = warmer/yellower light (2700K), higher = cooler/bluer light (4000K+)
LED	Light Emitting Diode - most efficient lighting technology

Appendix B

Where the Numbers Come From

All data comes from publicly available Swedish sources:

- **SMHI:** Climate data, graddagar
- **Boverket:** Building regulations
- **Energimyndigheten:** Grants and energy statistics
- **SCB:** Household consumption statistics

Appendix C

Printable: Energy Cost Tracking Sheet

My Energy Costs - Year _____

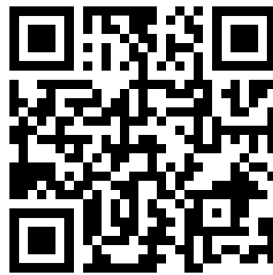
Month	Electricity	Oil	Wood	District heating
January	----- SEK/kWh	----- SEK/kWh	----- SEK/kWh	----- SEK/kWh
February	-----	-----	-----	-----
March	-----	-----	-----	-----
April	-----	-----	-----	-----
May	-----	-----	-----	-----
June	-----	-----	-----	-----
July	-----	-----	-----	-----
August	-----	-----	-----	-----
September	-----	-----	-----	-----
October	-----	-----	-----	-----
November	-----	-----	-----	-----
December	-----	-----	-----	-----
Annual avg	-----	-----	-----	-----

Notes:

- Electricity: Include grid fees, energy tax, VAT
- Oil: Include delivery fees, boiler service
- Wood: Include delivery, stacking, labor time value (150-300 SEK/hour)
- District heating: Include fixed fees

Appendix D

The Nexus Energy Assessment Service



Scan for your free energy assessment — I'll calculate it for you.

Can't scan the QR code?

- Type this URL into your browser: <https://nexusenergy.se/energycalc>
- Or search: "Nexus Energy Assessment" ¹
- Or email us: nexusinfo@nexusenergy.se and we will send you the link

What if the service becomes unavailable?

The assessment service is hosted on a nonprofit basis, but technical issues can occur. If you cannot access the online form:

1. Use the manual calculation methods in Chapter 5 (Power Metering)
2. Contact your municipal energy advisor (free service)
3. Email us and we will help

¹**Service status:** This assessment is provided as a free community resource. If the link above no longer works, please visit nexusenergy.se for updated access information. The calculation methods described in Chapter 5 (Power Metering) will always work, even without the digital service.

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Email: nexusinfo@nexusenergy.se

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