



ENERGYWISE GUIDEBOOK

for Apartment Buildings

ENERGYWISE GUIDEBOOK

for Apartment Buildings | October 2020, Version 1

TABLE OF CONTENTS

- 1 Who is this Guidebook for?
- 2 What is energy efficiency?
- 2 Why should apartment building owners improve energy efficiency?
- 3 Six steps to improving energy efficiency
- 7 Action plans for apartment buildings

Thank you to the following organizations for their contributions to the pilot program and this report: GKC Financial Ltd., Laebon Rental Communities, Reserve Studies Now, and Sierras of Heritage Village.

EXECUTIVE SUMMARY

This Guidebook is for owners and managers of apartment-style residential buildings in Red Deer, including both rental buildings and condominiums. It is aimed at organizations who are just starting their journey to improve energy efficiency in their building(s).

Being energy efficient means using the least amount of energy possible without affecting quality or comfort.

There are economic, social and environmental benefits to energy efficient buildings:

- » Spending less money on the variable portion of energy bills, and being less vulnerable to energy cost increases;
- » Many actions that improve energy efficiency make the building more comfortable and improve air quality, which contribute to improved well-being;
- » Reducing greenhouse gas (GHG) emissions and improving air quality.

The changes that are most commonly recommended for apartment buildings to save energy and provide good return on investment are:

Recommissioning. Ensure your current system is operating as efficiently as possible.

Lighting. This can include new lamps (bulbs), fixtures, and controls like occupancy sensors.

Electricity loads. Reduce the electricity used by building occupants and electronic equipment, including Energy Star refrigerators and automated washroom exhaust fans.

Heating controls. Only heat or cool when you need to by using building energy management systems and smart thermostats.

Air distribution systems. These systems bring air for heating or cooling to building occupants and affect both energy consumption and occupant comfort.

Heating and cooling systems. Ensure the equipment is sized properly and the most energy efficient option.

WHO IS THIS GUIDEBOOK FOR?

This Guidebook is for owners and managers of apartment-style residential buildings in Red Deer, including both rental buildings and condominiums. These buildings are sometimes known as multi-family or multi-unit residential buildings. It is aimed at organizations who are just starting their journey to improve energy efficiency in their building(s).

More than **20% of the homes in Red Deer are apartments.** Most of these buildings are one to four stories high, so this Guidebook focuses on them.

WHAT IS ENERGY EFFICIENCY?¹

Energy efficiency is using the least amount of energy possible to provide goods and services without affecting production, quality or comfort. For example, an LED bulb uses approximately 75% less electricity than an incandescent bulb to produce the same light.

WHY SHOULD APARTMENT BUILDING OWNERS IMPROVE ENERGY EFFICIENCY?²

There are economic, social and environmental benefits to having energy efficient buildings.

ECONOMIC



- » Using less energy means spending less money on the variable costs of your energy utilities (i.e. natural gas, electricity).
- » Buildings that use less energy are less vulnerable to energy cost increases.
- » Energy efficient buildings can be more attractive to buyers and tenants, who know that the building is likely to be less expensive to operate and more comfortable.
- » Increased comfort can reduce the costs associated with resident complaints.

SOCIAL



- » Many actions that improve energy efficiency make the building more comfortable, i.e. warm in the winter and cool in the summer.
- » Energy efficient buildings tend to have better air quality, reduced drafts and healthier temperature ranges, which contribute to reduced chronic disease and improved physical and mental well-being.
- » Energy efficient buildings stay more comfortable and safe during a blackout or disaster.
- » Owners of very efficient buildings can be acknowledged for their leadership, and energy efficiency can be a way to differentiate yourself from other buildings.

ENVIRONMENT



- » In municipalities such as Red Deer with high-carbon grids, reducing electricity use through energy efficiency is one of the best ways to reduce GHG emissions.
- » Every unit of energy we don't consume saves resources extracted from the earth and emissions associated with extraction, transmission and end-use, which improves air quality.
- » Being energy efficient supports The City of Red Deer's [Environmental Master Plan](#), which includes targets to reduce energy use and greenhouse gas emissions, and improve air quality.

¹ [NRCAN Energy Management Training Primer](#) p. 2

² [NRCAN Energy Management Best Practices for Commercial and Institutional Buildings](#) p. 7; [Pembina Institute Green Condo Guide](#) p. 2; [Pembina Institute Benefits of Energy Efficiency](#) p. 1; [FCM Municipal Energy Roadmap](#) p. 33

STEPS TO IMPROVING ENERGY EFFICIENCY

These six steps will help you become more energy efficient: commit, assess, set goals, plan, implement, evaluate.

1

COMMIT TO IMPROVEMENT³

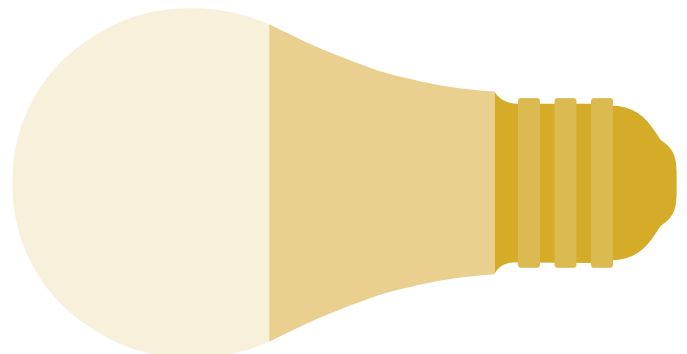
Demonstrating commitment to improving energy efficiency is the foundation. Depending on your organization, you could:

- » **Find a champion** in the owner(s) or senior management who will have a big-picture view of the organization's priorities, resources and challenges. They can ensure your work is aligned with overall objectives, rally resources and pave the way for support in other parts of the organization.
- » **Appoint a leader** to steer the organization's action on energy efficiency. This could be a member of the condo board, any unit owner, someone on the maintenance team, or a building manager. They won't do all the work themselves, but will be the point person for setting goals, tracking progress and promoting action.
- » **Identify a team** who will execute energy efficiency activities across different aspects of the organization. This could include representatives from the condo board, the maintenance team, the building management team, the finance team, whoever is responsible for making decisions about capital purchases, etc.
- » **Articulate your intentions** with a simple policy. It will formalize the organization's commitment to energy efficiency which will help employees, vendors, unit owners and other stakeholders understand your efforts.

A POLICY NEED ONLY IDENTIFY:

- Overarching goals of why you want to improve energy efficiency, e.g. "We want to save money and ensure our residents are healthy and comfortable."
- At a high level how you intend to achieve those goals, e.g. "We will track energy and analyse energy use annually, and report on results at our AGM."
- What parts of your building/business these goals apply to, e.g. "This policy shall apply to all facilities, business units and employees."
- Who approved the policy, i.e. CEO, president of the condo board, building owner or other primary decision-maker.

A SIMPLE POLICY WILL FORMALIZE THE ORGANIZATION'S SUPPORT AND COMMITMENT TO ENERGY EFFICIENCY WHICH WILL HELP EMPLOYEES, VENDORS, UNIT OWNERS AND OTHER STAKEHOLDERS UNDERSTAND YOUR EFFORTS.



³ [EPA Guidelines for Energy Management](#) p. 5, Appendix 2

STEPS TO IMPROVING ENERGY EFFICIENCY

2

ASSESS ENERGY USE⁴

You can't manage what you don't measure.

- » **Gather and track data** on how, when, and where energy is used in your building. This will help identify patterns and anomalies, and manage costs. [Energy Star Portfolio Manager](#) is a free online tool sponsored by [Natural Resources Canada](#) to help building owners track energy and water use. It is relatively easy to use, and you can find detailed user guides at [reddeer.ca/EnergyWise](#).
- » **Establish the starting point** in time from which you will measure progress, also known as a baseline. This could be the year the building was built or renovated, the first year you have energy usage data for the building, or last year. It can be whatever year makes sense for your organization; it just needs to be a year for which you have data.
- » **Understand your current energy use** by comparing your building's performance, also known as [benchmarking](#). Compare to its own past performance, other buildings in your portfolio, or its peers. Benchmarking helps determine the potential for improvement in the building, which is helpful when setting goals. [Energy Star Portfolio Manager](#) helps achieve this by providing an Energy Star score, rating your building against others of a similar size, type and location.

3

SET GOALS⁵

Setting clear and measurable goals is key for developing effective strategies for continuous improvement and reaping rewards.

- » **Articulate what you want to achieve** by laying out specific, measurable, achievable, relevant, time-bound goals. This is the who, what, when and where of what you want to accomplish. Get goals endorsed by owners/senior management.
- » **Consider indoor environmental quality goals.** There is potential to significantly improve resident health and comfort with retrofit measures.

4

MAKE AN ACTION PLAN⁶

Now you know where you want to go. How are you going to get there?

- » **Identify the gaps between your current performance and your goals**, and what actions will best help you bridge those gaps. This is easier with the help of professionals. Professional energy audits will provide specific information about what energy savings particular actions will achieve in your building. Remember to account for indoor environmental quality goals. Improving indoor environmental quality, such as air quality, requires active consideration at the design stage.
- » **Take a holistic view.** The success of large retrofit projects requires more than a focus only on the performance and benefits of each individual change. Integrated project design is key to achieve energy and carbon emission reductions, improve thermal comfort and air quality, and address deferred maintenance. Also consider integration of changes across utilities (i.e. gas, electricity, water) to enhance resource and cost savings, improve financial performance, and reduce risk of under-performance.

⁴ [Energy Star Facility Energy Management Assessment Matrix](#); [Energy Management Training Primer](#) p. 18

⁵ [EPA Guidelines for Energy Management](#) p. 13; [TAF's Retrofitting Arleta Manor: a TowerWise Case Study](#) p. 26

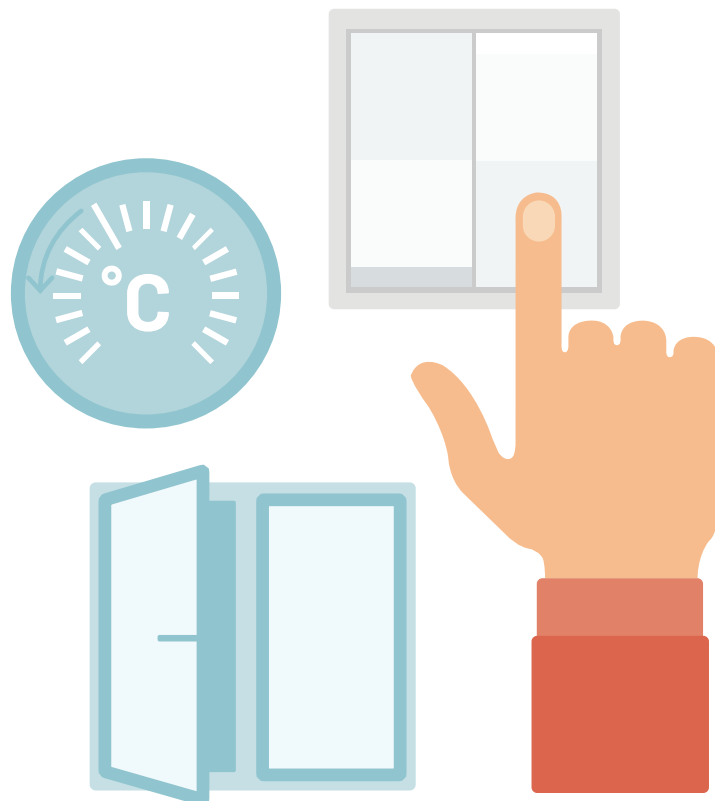
⁶ [Energy Star Facility Energy Management Assessment Matrix](#); [Pembina Institute Green Condo Guide](#) p. 4, 7; [TAF's Retrofitting Arleta Manor: a TowerWise Case Study](#) p. 26

- » **Challenge assumptions and re-evaluate building systems.** Existing building mechanical systems are often significantly oversized. Right-sizing retrofits can result in reductions in capital costs and energy consumption, and improved resident comfort.
- » **Evaluate the benefits and costs of each opportunity** to determine how they coincide with the goals you set. Don't just use payback period to evaluate costs; also consider take net present value and internal rate of return to get a more fulsome financial picture. The EPA's [Building Upgrade Manual](#) provides resources to help (Chapter 3). Also keep in mind non-financial benefits of retrofits. For example if your building looks dated, consider retrofits that can also enhance its appearance such lighting upgrades or new windows. If residents complain it's too hot or too cold, upgrade the heating control system.

- » **Determine roles and resources** by identifying who will be involved, what their roles and responsibilities will be, and what resources they will need. Investigate incentives and rebates. Different levels of government and utility providers often provide incentives to improve energy efficiency, and these might play a big part in deciding which actions to take first.
- » **Engage your stakeholders** by getting them on board with plans as they evolve. Participation of building owners is especially important during this step, when retrofit options are evaluated and there is opportunity to maximize expected outcomes. Present a draft plan to senior management and communicate with residents.

See the next chapter, *Action Plans for Apartment Buildings*, for options to start your action plan.

SETTING CLEAR AND MEASURABLE GOALS IS KEY FOR DEVELOPING EFFECTIVE STRATEGIES FOR CONTINUOUS IMPROVEMENT AND REAPING REWARDS.



STEPS TO IMPROVING ENERGY EFFICIENCY

5

IMPLEMENT ACTION PLAN⁷

You know what you want to do. Here are some tips to successful implementation.

- » **Create a communication plan.** Provide targeted information for key stakeholders about what you are doing, why, and how people will be affected. Retrofitting an occupied building can be challenging. Use consistent and clear communication about the project, highlighting the benefits and impacts that residents can expect. Engage with residents prior to installing new technology they will use, such as smart thermostats, to help identify potential implementation challenges and determine the best engagement strategy.
- » **Expand capacity** of staff, residents and other stakeholders through training, access to information, and sharing lessons learned. Training resources include:
 - [Canadian Institute of Energy Training](#)
 - [Energy Management Training Primer](#)
 - [Portfolio Manager Training](#)
 - reddeer.ca/EnergyWise
- » **Track and monitor project costs** and energy savings.
- » **Set up systems to maintain your investments and deliver long-term savings** by ensuring new equipment is maintained and operated correctly, staff is trained, and manufacturer recommendations are followed. Continuously commission and monitor systems to ensure they are operating as designed. This requires standardization, consistent tracking and monitoring, and use of qualified personnel to ensure controls are not overridden, systems are not switched into manual mode, and sub-optimal system operation is avoided.

THERE IS POTENTIAL TO SIGNIFICANTLY IMPROVE RESIDENT HEALTH AND COMFORT WITH RETROFIT MEASURES.

6

EVALUATE AND RECOGNIZE PROGRESS⁸

Taking the time to evaluate, celebrate and maintain momentum are important steps in any project.

- » **Measure results** and compare current performance to established goals. Are you making headway? Why or why not?
- » **Communicate your success.**
 - Update stakeholders, residents and tenants regularly about how the retrofit is performing against all the project's goals: social, economic and environmental. This will build momentum for future projects and keep residents and tenants engaged in ensuring the building stays energy efficient.
 - Provide internal recognition to individuals, teams and facilities within your organization.
 - Seek external recognition from government agencies, media and other third party organizations that reward achievement.
- » **Integrate energy efficiency into all planning, projects and operations.** Consider lifecycle, energy and operational costs in all decisions. Embedding energy-efficient policy and procedure into your procurement process is especially effective.

⁷ [Energy Star Facility Energy Management Assessment Matrix](#); [TAF's Retrofitting Arleta Manor: a TowerWise Case Study](#) p. 26; [Pembina Institute Green Condo Guide](#) p. 9

⁸ [Energy Star Facility Energy Management Assessment Matrix](#)

ACTION PLANS FOR APARTMENT BUILDINGS

These options are starting points for your action plan, designed to help you get the best return on investment and make the most effective changes possible in your organization's context.

OPTION A: WORK WITH WHAT YOU HAVE⁹

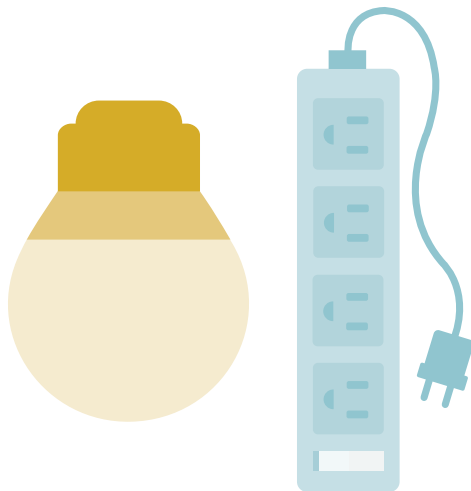
For a DIY approach, consider the following.

- » **Follow Energy Star's recommendations** for [low and no-cost energy efficiency measures](#):
 - Conduct a nighttime audit to find out what's on after hours that shouldn't be.
 - Establish a preventative maintenance program for major systems and components, including monthly maintenance of heating and cooling equipment to guarantee efficient operation throughout the year. [BOMA has best practices for multi-family buildings](#) (page 7).
 - Visually inspect insulation on all piping, ducting and equipment for damage (tears, compression, stains, etc.). Repair and replace damaged/missing insulation.
 - Turn off lights when not in use or when natural daylight is sufficient.
 - Open or close blinds to make the best use of natural daylight and to prevent or encourage heat gain as needed (closed in summer, open in winter)
 - Remove unnecessary light bulbs in over-lit areas.
 - Set back the thermostat in the evenings.
 - Calibrate thermostats to ensure that their ambient temperature readings are correct.
 - Make sure that areas in front of vents are clear of furniture and paper.
 - Keep exterior doors closed while running your heating/air conditioning.
 - Educate employees and building occupants about how their behaviors affect energy use.
- Ask your utility provider(s) if they offer free or inexpensive energy audits and/or equipment rebates.
- Conduct an [Energy Star Treasure Hunt](#): this guide will help you tour your facility with fresh eyes, looking for quick ways to reduce energy use by up to 15 percent.
- Ensure that you have all manuals, plans, designs, drawings, specs, maintenance records, etc. for building and equipment available. Use them to ensure your building and equipment are operating optimally.
- » **Implement Energy Star's recommendations** for action with [rapid payback](#):
 - Recommission the building to make sure it's running the way it was intended. Find resources on how to do this from [NRCAN](#).
 - Repair leaking faucets and equipment.
 - Replace old fluorescent and incandescent lighting with T-8 (or even T-5) fixtures, ENERGY STAR certified LEDs, and other energy-efficient lighting systems.
 - Install occupancy sensors to automatically turn off lights when no one is present.
 - Consider switching from high-pressure sodium lamps to metal halide lamps in parking lots and upgrading to LED lighting for outdoor signage.
 - Tune up your heating, ventilation and air conditioning (HVAC) system with a maintenance contract that provides pre-season tune-ups before each cooling and heating season.
 - Plug air leaks with weather stripping and caulking (see [Air Leakage Control for Multi-Unit Residential Buildings](#)).

⁹ Energy Star's [low and no-cost energy efficiency measures](#) and actions with [rapid payback](#); [Energy Star's Facility Energy Management Assessment Matrix](#)

ACTION PLANS FOR APARTMENT BUILDINGS

- » **Modify purchasing practices** to ensure you are taking energy efficiency into consideration with everything you buy.¹⁰ Use every replacement as an opportunity to improve energy efficiency, not only with the specific thing you are replacing but with the system related to it. For example if you are replacing the siding, could leaks be sealed or insulation improved at the same time?
- » **Incorporate energy efficiency into capital plans** to prepare technically, financially and operationally for energy efficiency improvements. For example, opting for the most efficient boiler on the market when you are already replacing your existing boiler will result in a much faster return on investment.



ADVICE FOR CONDO BOARDS

While all condominium properties in Alberta must update their Reserve Fund Study every five years to plan for capital replacements, these studies only estimate the cost of replacing existing infrastructure with items of similar type and quality. There is no formal accounting for upgrades or improvements in technology.

Therefore it is up to the condo board/building owners to plan financially and explore options for improvement with assistance from their condominium management company or other professionals. Investments in energy efficiency can have good return for your unit holders; examine the payback period, net present value and internal rate of return to get a fulsome picture. Start by considering the common changes recommended for Red Deer's buildings from the EnergyWise for Apartment Buildings program and use the [EPA's Building Upgrade Manual](#) for resources to help with financial evaluations (Chapter 3). Don't forget to factor in non-financial benefits like improved resident health and comfort.

OPTION B: FOLLOW IN THE FOOTSTEPS OF OTHERS

There are some common recommendations for these types of buildings to improve energy efficiency.

- » **The City of Red Deer's EnergyWise for Apartment Buildings pilot program** conducted professional energy audits on three low-rise buildings with natural gas boilers. The following actions were recommended in at least two out of three audits:

- **Lighting:** upgrade existing fixtures to LED technologies and reduce the number of

fixtures/bulbs where possible. LED lights offer low power consumption, long life and the ability to use advanced lighting controls, and can also improve light quality, i.e. the right colour/brightness for the situation. The [Energy Trust of Oregon](#) and [Lighting Research Centre](#) have advice on getting started in multi-family buildings.

¹⁰ [Energy Star's Purchase energy-saving products](#)

- **Insulate hot water pipes:** insulating domestic hot water pipes is the lowest cost action recommended in these audits, and was recommended for all three buildings to reduce heat loss and decrease natural gas use.
- **Low flow showerheads:** changing showerheads to low-flow (less than 7 litres per minute) will save both water and gas. [Ottawa Housing chose a 5.7 litre per minute showerhead](#) that provided the highest water pressure at the lowest flow rate.
- **Baseboard controls:** replace wall-mounted analog controls with digital smart thermostats that have scheduling and setback capabilities. This will ensure heating is automatically setback when the space is unoccupied and will result in significant energy savings. [Learn how this action saved roughly 10% in space heating costs per year](#) and greatly increased tenant comfort.
- **Energy Star refrigerators:** when refrigerators are ready to be replaced (life expectancy of a fridge is 15 years) choose high efficiency Energy Star models, which use about 10% less energy.
- **Washroom exhaust fans:** install a relative humidity (RH) sensor in washrooms to automatically control the exhaust fan based on humidity, with the RH set point controlled by the facilities staff. This project results in energy savings and helps mitigate moisture issues.
- **Small building automation system (BAS):** installing a BAS, also known as direct digital control (DDC), allows much higher levels of control of the make-up air units and the boilers, enabling advanced energy savings control measures to be implemented based on actual conditions in the building, season and demand. In addition to energy savings, a BAS allows for improved comfort control and identification of maintenance issues.
- **High efficiency condensing make-up air units (MUAs):** MUAs deliver outdoor air to interior spaces. They are very important part of your heating/cooling system and can affect the safety and comfort of the building, e.g. ensuring dangerous fumes and odours are vented. An improved MUA could increase efficiency from 75% to 97%. [This case study recommends you undertake duct cleaning](#) at the same time to maximize fresh air benefits.

See the full reports under the EnergyWise for Apartment Buildings section at reddeer.ca/EnergyWise.

» [Canada Mortgage and Housing Corporation has six themes for achieving high-performance multi-unit residential buildings:](#)¹¹

- **Space and water heating:** 80% of energy used is for space and water heating. Consider high efficiency condensing boilers (21% energy savings), heat recovery ventilation systems (13% energy savings), and adjusting thermostats (6-11% savings).
- **Ventilation and air quality:** windows, air leakage and ventilation systems make up 75% of the space heating energy loss.
- **Building envelope:** 40% is the optimal window-to-wall ratio, and if well-placed, can achieve 80% of annual interior daylighting needs.
- **Measurement, control and accountability:** about 12% more electricity and 15% more water is used in suites that are not metered and billed individually.
- **Lighting and plug loads:** LEDs and occupancy sensors can reduce electricity needed to light space by 80% without compromising lighting levels; energy efficient in-suite appliances can generate electricity savings of 9-25%.
- **Water consumption:** plumbing retrofits have achieved 37% water savings.

¹¹ [CMHC's Achieving High Performance Multi-unit Residential Buildings](#)

ACTION PLANS FOR APARTMENT BUILDINGS

- **High efficiency condensing boilers:** at the end of their serviceable life replace existing boiler(s) with high-efficiency condensing models. To maximize the savings, the boiler return water temperature should be minimized. This [CMHC case study](#) found robust rates of return due to efficient and appropriately sized equipment.
- » **Federation of Canadian Municipalities' Municipal Energy Roadmap** recommends specific actions to improve buildings in Alberta. While apartment buildings weren't included in the analysis, the roadmap can be used as a starting point. Solutions with the best return on investment for commercial and residential buildings are:¹²
 - **Improved heating, ventilation and air conditioning (HVAC) controls** reduce unnecessary running of systems, e.g. smart thermostats, building energy management systems.
 - **High-efficiency lighting** including energy-efficient light bulbs, improved lighting controls, and using natural light effectively.
 - **Reducing plug loads**, which is the energy used by appliances and electronic devices, e.g. refrigerators.

OPTION C: CALL THE PROFESSIONALS

A professional energy audit will evaluate the building's current operating performance, its systems and equipment to determine where it is using the most energy and the best opportunities for energy savings.

An energy audit should include at least:¹³

- » **Inspection and documentation of all of the building's major mechanical and electrical systems including:**
 - Heating, ventilation and air conditioning (HVAC)
 - Building automation system (BAS)
 - Domestic hot water equipment (DHW)
 - Water systems and associated conservation equipment
 - Common area lighting
 - Garage heating, ventilation and lighting
 - Laundry room appliances and equipment
 - Building envelope (windows, doors, insulation, and air tightness)
 - Inspection of a representative sample of suites to identify in-suite conservation opportunities
- » **Energy and utility analysis including:**
 - Two or more years of historical utility data
 - Summary and breakdown of building's energy use and costs by fuel source and end use
- » **Recommended energy conservation measures including:**
 - Both operational and equipment changes
 - Estimate of costs, savings, payback and return on investment for each measure
 - Potential for renewable energy

See tools to procure qualified energy auditors, such as an Expression of Interest and a Request for Quote, under the EnergyWise for Apartment Buildings section of reddeer.ca/EnergyWise.

¹² [FCM's Municipal Energy Roadmap](#)

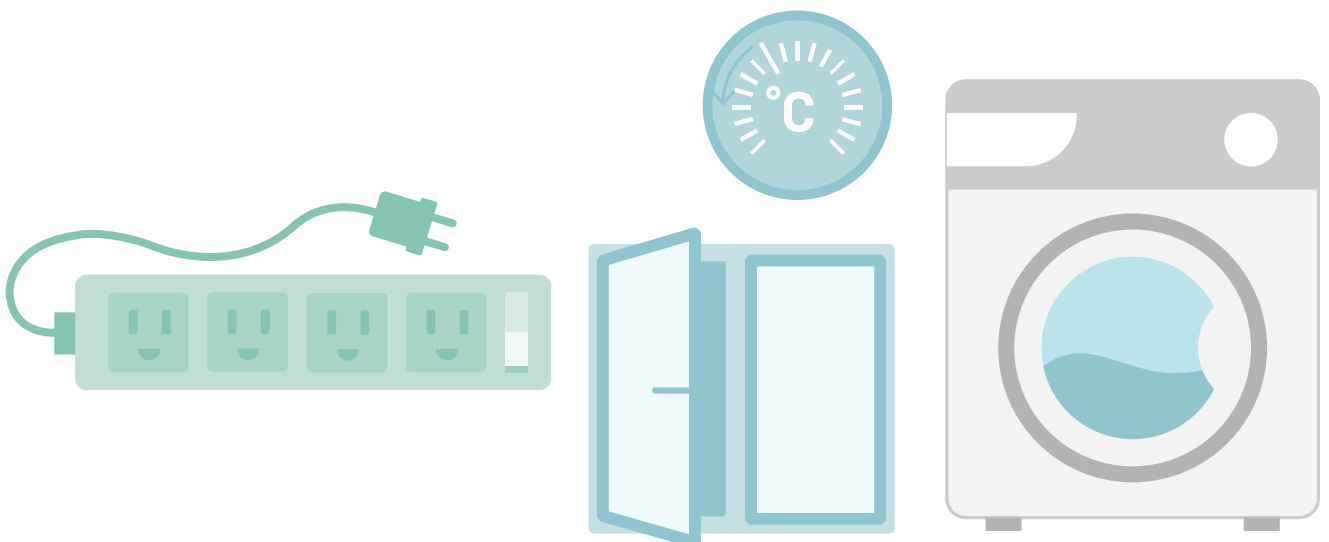
¹³ [Pembina Institute Green Condo Guide](#) p. 5

OPTION D: TAKE A STAGED APPROACH¹⁴

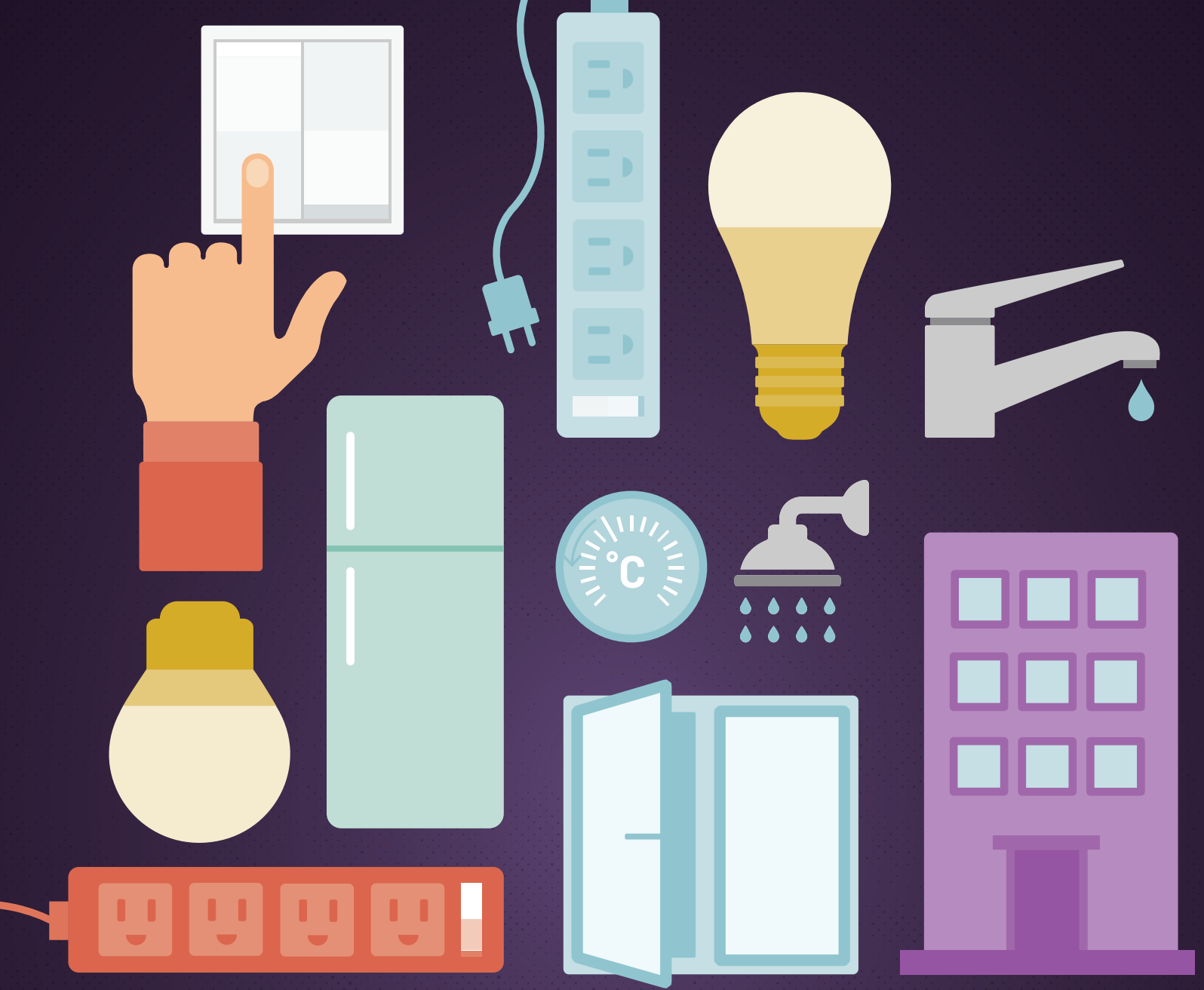
Energy Star recommends a staged approach where each stage includes changes that will affect the upgrades in subsequent stages, thus setting the overall process up for the greatest energy and cost savings possible.

The five stages are:

1. **Recommissioning.** This provides an understanding of how closely a building comes to operating as intended. It helps identify improper equipment performance, equipment or systems that need to be replaced, and operational strategies for improving the performance of the various systems.
2. **Lighting upgrades.** Lighting affects heating and cooling loads, and power quality. Upgrades may include new light sources, fixtures and controls.
3. **Supplemental load sources.** This is electricity used by building occupants and electronic equipment, and affects heating, cooling, and electric loads. With careful analysis of these sources and their interactions with HVAC systems, equipment size and upgrade costs can be reduced.
4. **Air distribution systems.** These systems bring conditioned air for heating or cooling to building occupants, and therefore directly affect both energy consumption and occupant comfort. Systems can be upgraded and adjusted to optimize the delivery of air in the most energy-efficient way.
5. **Heating and cooling upgrades (HVAC).** The previous 4 steps should have reduced cooling and heating loads. Many existing systems are oversized to begin with, so it may now be possible to replace the current system with a properly sized one or retrofit it to operate more efficiently. Besides saving energy, proper sizing can reduce noise, lower first costs for equipment and optimize equipment operation, which in turn reduces maintenance costs and extends equipment life.



¹⁴ [Energy Star Building Upgrade Manual](#)



ENERGYWISE GUIDEBOOK

for Apartment Buildings

For more information:
Environmental.Initiatives@reddeer.ca