

# ENERGY CONSERVATION IN COMMERCIAL BUILDINGS





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# INTRODUCTION

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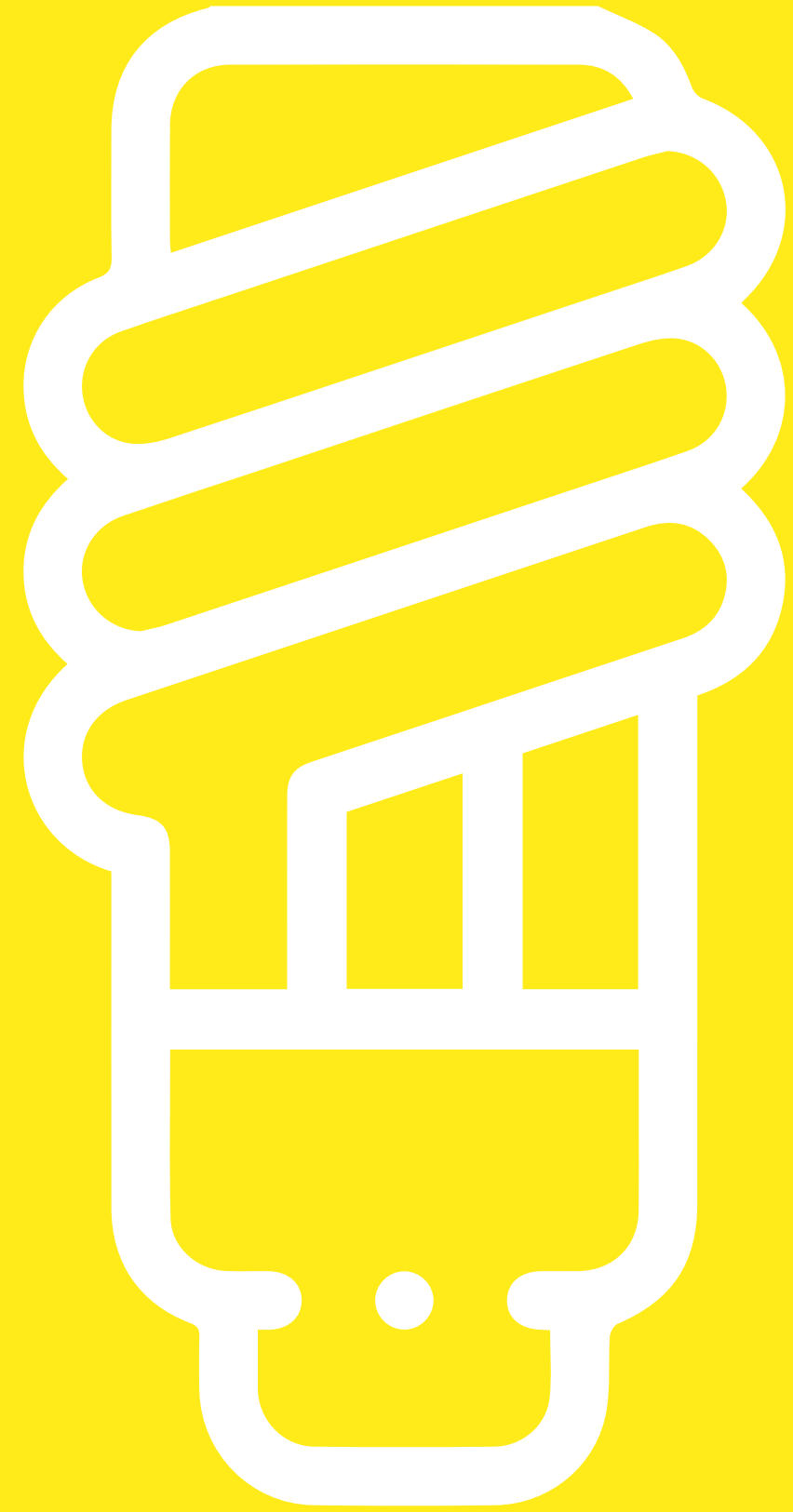
Property managers of commercial buildings have long been making efforts to cut their operating costs, reduce utility consumption and strive for zero-emission of buildings. However, in view of the current situation, the strategies and plans related to sustainable development and building upgrades, scheduled for implementation over the coming years, must be modified.

This year's increase in energy prices and the prospects of reduced power supply have given rise to a significant concern among the commercial real estate sector companies. They are, however, prepared to make reasonable savings.

Commercial facilities in Poland vary widely. They include shopping centres and retail parks, office buildings, warehouses, and differ greatly in terms of their functions and energy demand. Each has its own characteristics, history, advantages and limitations. Therefore, this guide should be considered a source of inspiration related to many areas, rather than a checklist setting tough requirements while ignoring the characteristics of specific buildings.

The Polish Council of Shopping Centres and the Polish Chamber of Commercial Real Estate invite you, as their supporting members, to read this guide and learn about the opportunities and ways to reduce energy and other utilities consumption in the coming months.

The industry experts and decision-makers have been reassuring us that the savings introduced will not compromise the comfort of employees and customers, or operation of our facilities for that matter. These savings, though, must never compromise safety, predictability, common sense or the technical conditions of a property.



# 1. LIGHTING

# LIGHTING

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**According to experts, the primary way to reduce energy consumption in commercial facilities with regard to lighting is to replace the existing light sources with energy-efficient (LED) lighting. This applies to both outdoor and indoor lighting. The next step is to reduce the time of operation of lighting fixtures during the closing hours of the facilities. However, when planning changes related to the use of lighting in commercial buildings, one should always keep in mind the current regulations and safety issues related to customers and employees.**



LIGHTING

# OUTDOOR LIGHTING OF COMMERCIAL FACILITIES

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- Using LED luminaires,
- Switching off external illuminated tenant logos after the facility closes or after 10:00 pm, switching it on after dusk,
- Lighting of outdoor parking lots (uncovered) - lamps operating at 30% to 70% of their capacity depending on peak hours and the number of cars entering the parking lot,
- Turning off outdoor decorations after 10:00 p.m. and when the facilities remain closed/ turning off outdoor decorations between 8:00 a.m. and 3:00 p.m.,
- Reducing façade illumination during the day by 30% and turning it off when the facility is closed - e.g., installing twilight switches to control outdoor lighting, including façade lighting and semi-open parking lots,
- Reducing other lighting around the building - sidewalks around the facility, parks, delivery areas, ramps - e.g. by installing motion detectors, reducing light intensity - in line with the safety requirements.

# INTERIOR LIGHTING OF COMMERCIAL FACILITIES

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- Using LED Luminaires,
- Switching off illuminated tenant logos inside a facility after it closes or after 10:00 pm,
- lamps operating at 30% to 70% of their capacity depending on peak hours and the number of cars entering the parking lot, or switching from primary lighting to supplementary lighting (only in the afternoon),
- Lighting of walkways in shopping centres and hallways and common areas in other buildings reduced to the statutory minimum, shifting the lighting time of parts walkways and parking lots so that it works only when customers/employees are there,
- Reducing light intensity in areas with less customer traffic - 24/7 or by using motion detectors,
- Using internal lighting intensity sensors (e.g., ceilings without skylights in walkways), use of DALI luminaire control systems,
- Turning off decorative lighting between 8:00 a.m. and 3:00 p.m. (except days preceding holidays and weekends) or turning off some of the permanent lighting of walkways when decorative lighting is on so as to comply with statutory lighting standards,
- Reducing night lighting to a minimum in compliance with the safety standards and evacuation lighting regulations - e.g., reducing lighting by 50% (or more) prior to the arrival of customers and tenant employees, turning off parking lot lighting and having it turned on manually by a security officer when a “night” user arrives.

- Reducing the lighting used by cleaning and security companies - reducing the cleaning time, reducing the time of additional lighting of common areas, illuminating only those sectors of the mall where cleaning is being carried out,
- Maximizing the use of daylight - the use of sensors at skylights in walkways to avoid lighting with artificial light when sunlight (DALI systems) or BMS is sufficient,
- Switching emergency and evacuation luminaires to dark mode (after consulting fire experts with respect to each building),

- Equipping stairwells with motion detectors and lighting them only when there are people inside them,
- Reducing light in unused premises (e.g., not illuminating display windows in shopping centres),
- Switching off additional illumination of displays and information kiosks.



# INTERIOR LIGHTING OF ADMINISTRATIVE PARTS AND COMMERCIAL FACILITIES

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- Using LED Luminaires,
- Switching off lighting in rooms when there are no people inside (installation of presence detectors or automatic lighting control),
- Analysing the lighting needs of office and administrative parts and adjusting their lighting according to the mode of operation of the team (e.g., in the case of hybrid work, when the entire team works remotely one day, the lighting can be completely turned off on that day),
- Using individual office lamps instead of overhead lighting,

- Determining common break/meal times for office staff to optimize the use of light in the kitchen and encourage boiling water and using electrical kitchen appliances together, rather than individually.





## 2. HVAC

# HVAC

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**HVAC systems, i.e. heating, ventilation and air conditioning, account for most of the power consumed by a shopping centre. Experts primarily propose lowering the temperature in shopping centres in winter and raising it in summer as much as possible, as well as making the most of natural methods (gravity ventilation, natural ventilation). They also point to the use of analytical and automatic control devices to optimize system operation as being equally important.**



HVAC



# AIR CONDITIONING, VENTILATION, RECUPERATION, MECHANICAL AND GRAVITY VENTILATION

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- Switching all HVAC systems off during the night (on selected days, when the weather conditions allow it),
- Lowering the temperature in the common areas and, as agreed, in individual premises - automated temperature control depending on the outside temperature,
- The target temperature in common areas could range between 19-17 degrees Celsius (depending on the weather and the anticipated savings) in winter, and min. 26 degrees Celsius in summer,
- Reducing the use of air humidification systems in winter or switching them off completely,
- Using recuperators and air mixing systems,
- Opening windows (if any openable) to intensify air exchange and humidification,
- Adjusting the amount of fresh air to the number of people inside the building (requires individual analysis of the building permit design and as-built documentation and, if justified cases, confirmation of the changes with the Sanitary Authority),
- Controlling time programs in HVAC BMS and the lighting, and reducing the same especially at night and on weekends in garages and common areas.

- Increasing the number of the required devices and their parameters for precise temperature measurement and control,
- Optimization/reduction of the cooling systems settings (using heat recovery systems),
- Installation of thermal insulation mats on cooling devices,
- Temporary shutdowns of selected fans and reduction of their operation, especially when they remain closed and during low footfall,
- Cascading activation of HVAC equipment - from the lowest to higher levels + using inverters,

- Up to 12:00 (or from 16:00), setting two-speed ventilation devices with inverters to 1st gear, after 12:00 (or 16:00) - to 2nd gear,
- Switching off some of the ventilation devices after 8:00 pm (all year round) and during transitional periods (as long as possible),
- Turning off heating in technical warehouses/maintaining low temperatures in warehoused to prevent freezing of liquids or destruction,
- Maintaining minimum temperatures at night (to avoid peak power at 8:00 am),
- Possibly making extensive use of gravity ventilation.

- Increasing the acceptable temperature inside the building to 26 degrees Celsius during the summer,
- Increasing the start-up time of ventilation devices (reducing start-up peaks) and reducing ventilation operation time,
- Switching on chillers only when the temperature rises to 26 degrees Celsius,
- Minimizing the operation of gas-fired boilers (especially during the introduction of successive supply degrees),
- Switching off air curtains at entrances during the transition period,
- In winter and summer, switching on the air curtains only at extremely low/high temperatures or rotational operation of the air curtains,
- Limiting the operation of central units - setting the rooftop units to a minimum value,
- Making improvement in the electrical system, e.g., division of circuits into a double switch so as avoid turning on all the lights (e.g., in selected hallways, utility rooms),
- Avoiding heating of skylights (the circuit to be turned off throughout the year, the heat generated in the facility will heat the walkways and skylights by gravity),
- White certificates - modernization of cooling and ventilation systems. WKTO as part of the upgrade:
  - a) CO2 sensors installed (to control fan performance)
  - b) optimizing the operation of air handling units (adjusting the time and level of operation to the opening hours of the facility and to footfall)



- Installing blinds/curtains under skylight strips (if skylights are equipped with smoke ventilation dampers - shutters in the form of louvers and curtains should be additionally consulted with a fire expert),
- Turning off the heating in the technical/service corridors - setting the heaters to operate at a level preventing freezing,
- Using air recuperation to the greatest extent possible,
- For facilities equipped with gas-fired boiler plants - analysing the profitability of connecting the facility to the municipal heating network (if possible),
- For facilities equipped with gas boiler plants - use of heating curve and night temperature reduction,

- More frequent servicing of rotary exchangers (cleaning!) and more frequent inspection of the dirt level - this will increase the active surface of heat exchange and heating/cooling efficiency,
- Sealing and increasing insulation of air ventilation ducts,
- Using timers on switchboards to control lighting and other equipment with limited operating hours.



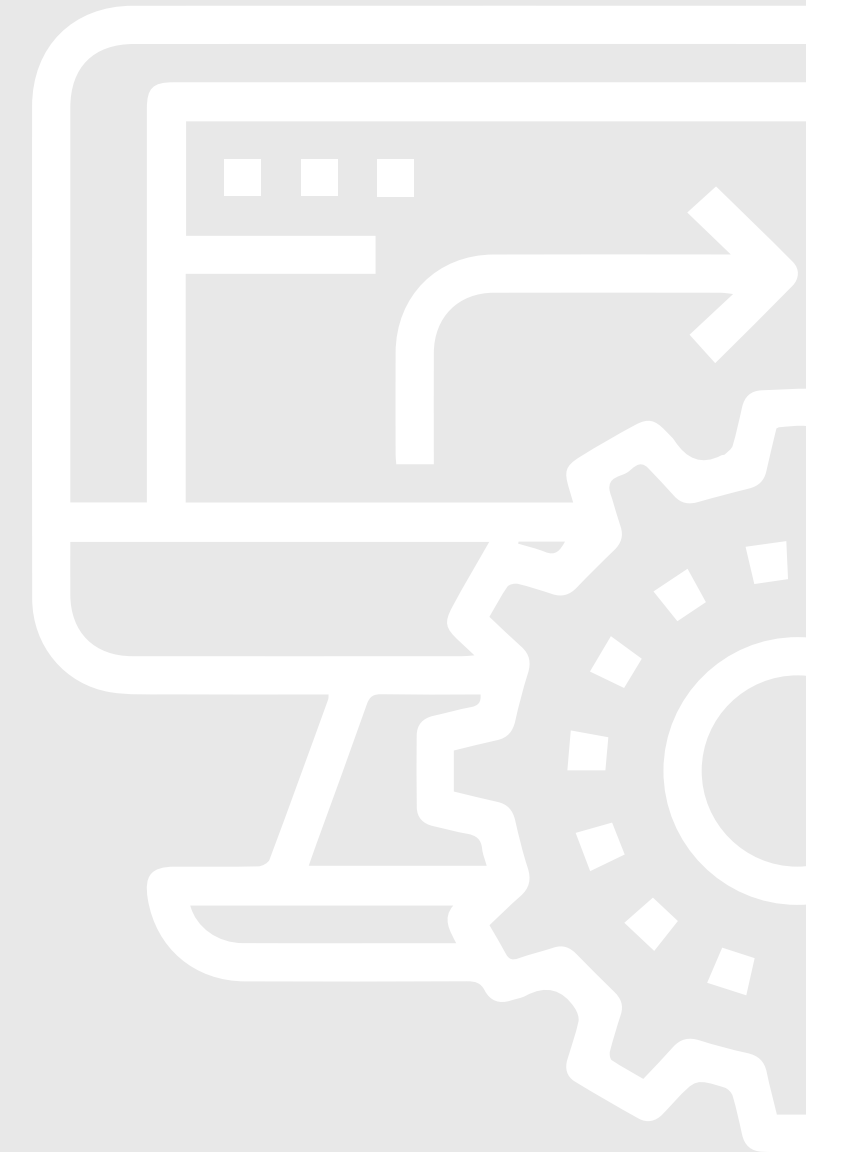
# **3. BMS, AUTOMATION AND PROCESS AUDITING**

# **BMS, AUTOMATION AND PROCESS AUDITING**

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**BMS systems have long been operating in office buildings as a standard solution; they are becoming increasingly popular in warehouses and commercial facilities, but are not yet a standard solution.**

**The main advantage of a BMS in a facility is the ability to analyse the performance of the existing installations. Experts emphasize that in the context of reducing energy consumption, BMS systems make it possible to reduce the use of different systems and to identify duplicate or mutually interfering equipment.**



**BMS, AUTOMATION AND PROCESS AUDITING**



# BMS, AUTOMATION AND PROCESS AUDITING

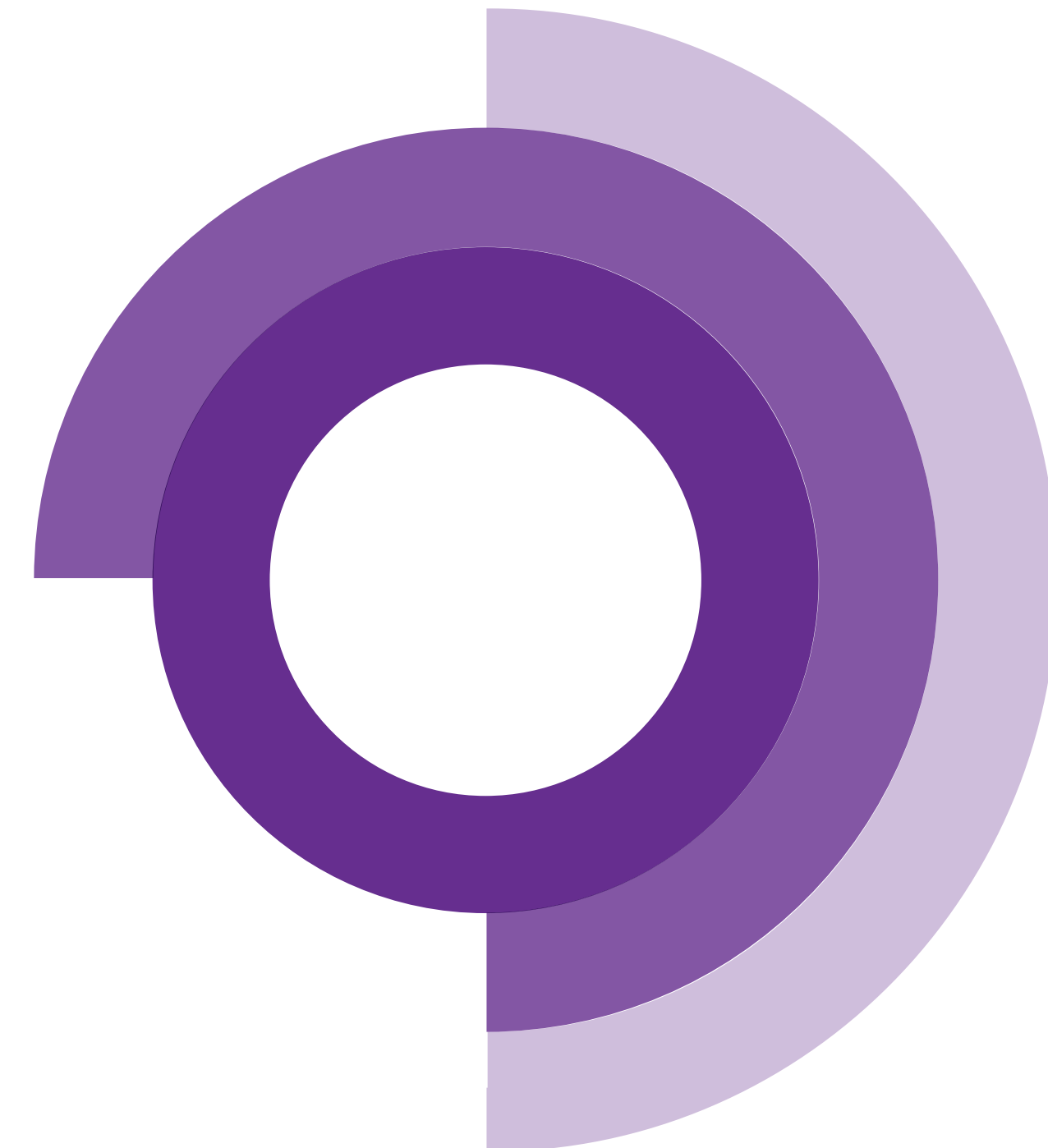
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## Effective energy audit:

- a) measuring the HVAC system parameters (heating, ventilation and air conditioning),
- b) Inspecting and adjusting the automation/BMS systems,
- c) Measurements as part of the LEED, BREAM certification system,
- d) Testing the indoor and outdoor air quality to optimize the performance of ventilation systems,
- e) Microbiological testing of air,

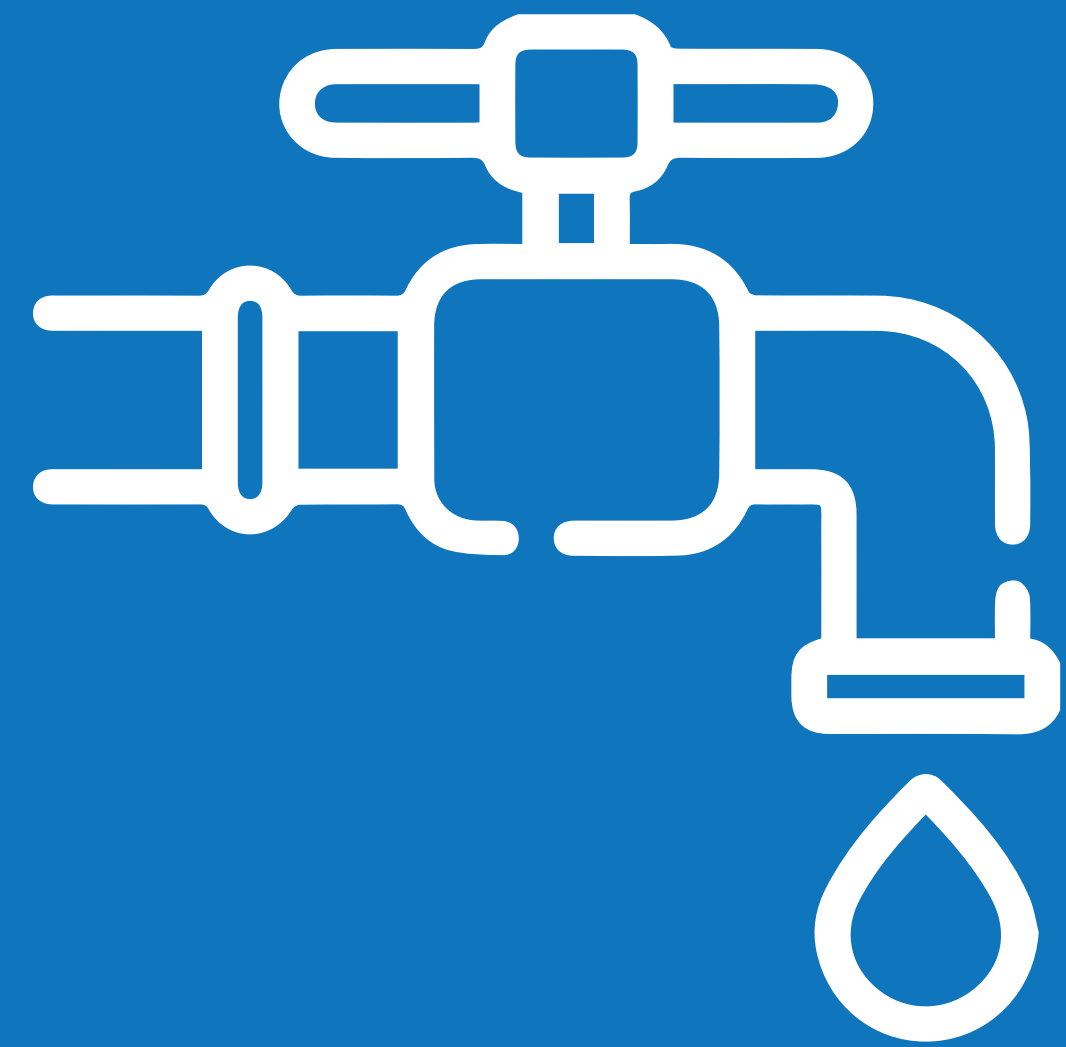
f) Acoustic analyses,

g) Thermographic analyses.



- Energy consumption analysis covering the last three years (including the period before the COVID-19 pandemic) and mapping of energy-intensive areas to eliminate heat loss,
- Energy consumption analysis of large tenants food centres (especially refrigeration/freezer sections) to minimize overall energy consumption in the facility,
- Identifying thermal bridges with a thermal imaging camera and their elimination,
- Eliminating devices which duplicate or may duplicate other devices,

- Using BMS systems - precise timing of start-up of devices only when their operation is really needed, controlling the presence of CO<sub>2</sub>, using favourable atmospheric conditions to optimize the operation of devices (free cooling),
- Restricting the operation of de-icing heating and introducing snowfall sensors to operate heating ducts to run the heating system only when there is a legitimate need,
- Analysing the monthly gas consumption of individual devices (detecting the most energy-intensive points in order to optimize their operation),
- Thermal imaging analysis to detect leaky/insufficiently insulated areas.



## **4. HOT AND COLD WATER**



# HOT AND COLD WATER

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Heating water in commercial buildings usually generates quite high energy consumption. Experts advise lowering the temperature of hot water to 35-40 degrees Celsius and reducing its heating, if necessary.



HOT AND COLD WATER

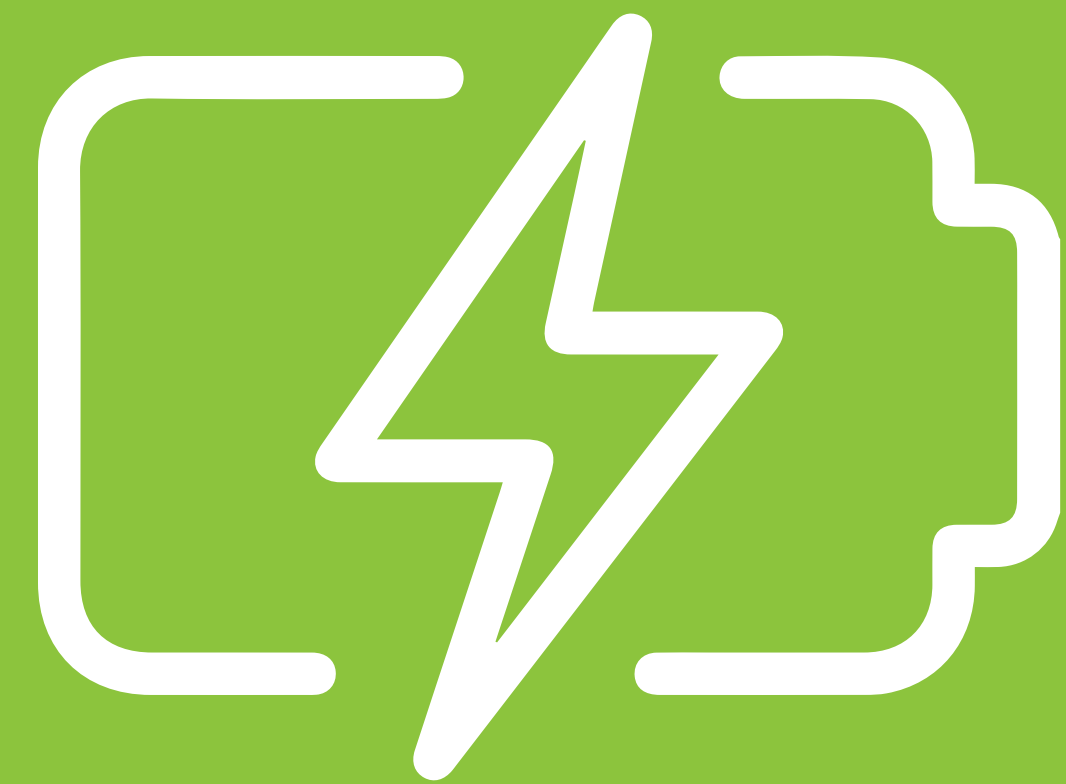
# HOT AND COLD WATER

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- Using low-flow fittings,
- Using heat recovery methods (depending on the amount of investment),
- Heating water outside periods of intensive energy consumption,
- Reducing hot water and heating settings in customer toilets,
- Reducing the temperature of hot water in toilets or temporarily reducing the supply of hot water to toilets, e.g. to 35-40 degrees Celsius,



- Reducing the temperature in the heating system to the minimum,
- Heating up water just before its consumption, if possible outside of peak power periods.



# **5. POWER PROCUREMENT AND ANALYTICS**



# POWER PROCUREMENT AND ANALYTICS

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**The key issue related to the level of power procured is to match the level of the procurement to the actual needs of the facility. A rational and detailed analysis of the power needs is necessary for a procurement to be optimal.**

POWER PROCUREMENT AND ANALYTICS

# POWER PROCUREMENT AND ANALYTICS

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- Analysing the level of the contracted and procured power, allowing even one penalty per year for exceeding it,
- Analysing the level of contracted thermal energy capacity and procuring it at a level that is reasonable in relation to the recorded maximum levels for the last 24 months (The standard practice is to order values exceeding the actual demand by even 100-200%). The risk of underheating in the event of the onset of a prolonged and severe winter such as we have not recorded in the last years. Without investment, the possibility of making savings after the period allowed by the heat seller from the application.),
- Analysing the consumption in the context of the power fee and reactive power and properly selected contracted power (if orders to date have been too large),
- Installation reactive power compensators and reducing procured power down to actual needs.



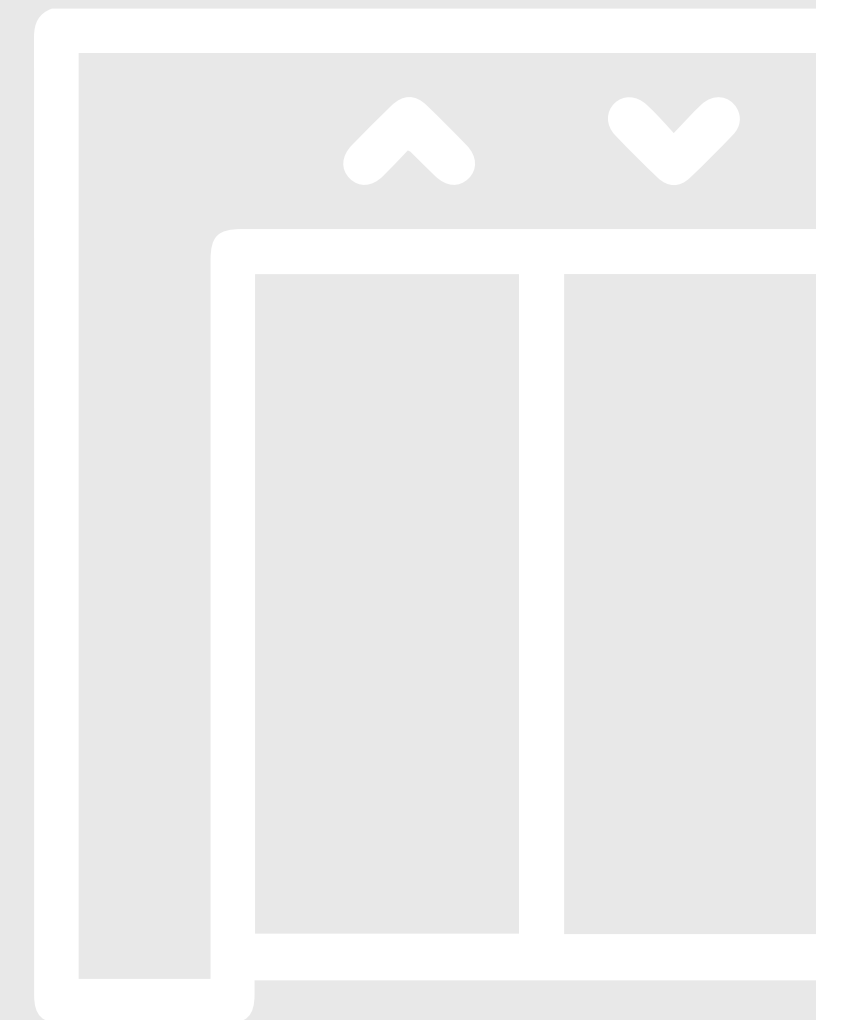
# **6. EQUIPMENT AND ELEVATORS**



# EQUIPMENT AND ELEVATORS

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**There are a number of appliances in commercial facilities with very different energy classes and energy requirements. The most important of these are elevators and travelators. Energy savings can also be arrived at by reducing their availability, especially during low footfall.**



EQUIPMENT AND ELEVATORS

# EQUIPMENT AND ELEVATORS

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- Switching off some of escalators (and closing them to customers/ employees) during morning hours, when alternative traditional stairs or elevators can be used,
- Using escalators with proximity sensors,
- Setting escalators and travelators (in commercial and mixed-use facilities) to the creep speed mode,
- Using devices with energy efficiency certificates,

- Shortening the operation or turning off fountains, ponds, waterfalls inside and outside the building,
- Shortening the operation or turning off other architectural and visual installations (children's toys, vending machines, information kiosks, touchscreens),
- Turning off electric dryers - using paper towels,
- Improving the tightness of automatic doors.



# **7. OPERATIONAL ISSUES**

# OPERATIONAL ISSUES

## - TIPS FOR TENANTS

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Reorganizing the operation of a commercial facility can bring tangible benefits. These mainly concern accidental and uncontrolled heat loss in various situations related to the operation of a facility (on entering or exiting it and exit and during deliveries). An important way to optimize the energy costs is also to align the routine daily activities with the building's energy cycle and move them outside the peak power consumption peak hours.



OPERATIONAL ISSUES - TIPS FOR TENANTS



# OPERATIONAL ISSUES - RETAIL SPACE

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- Limiting the tenants' ability to adjust temperature, ventilation, humidification individually,
- Moving ice production outside the opening hours,
- Moving the battery charging period of storage, cleaning and other equipment outside the opening hours,
- Opening entrance doors alternately/crosswise (in vestibules),
- Opening doors halfway,
- Closing external doors to tenants' stores if there is an internal entrance from the hallway,
- Reorganizing the work of service companies (facility management) so as to reduce the illumination of selected common parts of facilities (e.g., by directing people to work in daylight),
- Shifting the maintenance time of chillers and freezers.



- Ensuring that gates and doors in delivery areas are closed when not in use,
- Arranging for deliveries to be handled through one gate only, one after another (within a specific time frame),
- Closing gates during deliveries which take a long time to unload (if possible) and opening them after the unloading is completed,
- Automating the delivery notification process - reducing the delivery time,
- In summer, when the air temperature is 16-22 degrees Celsius, opening revolving doors and locking sliding doors (if it is possible to provide another entrance for people with limited mobility).



OPERATIONAL ISSUES – RETAIL SPACE



# OPERATIONAL ISSUES - OFFICE SPACE

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## Electricity, lighting

- Incentives for tenants to replace lighting fixtures with LEDs,
- Optimization of office working hours,
- Analysing the operation of office equipment - ensuring that it does not consume energy for 24 hours without a purpose,
- Analysing the advertising media on the premises of a facility (e.g. logos, monitors, etc.). - ensuring that they are equipped with energy-efficient LED light sources, have timers or twilight switches, and that their operation time is optimized,
- Rearranging the space in such a way as to place workstations in areas exposed to daylight,
- Encouraging office staff to use stairs as often as possible,
- Replacing electric dryers in tenants' toilets with paper towels.



# OPERATIONAL ISSUES - OFFICE SPACE

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## Heating and air conditioning

- Incentives for tenants to optimize office temperature (lowering the temperature, encouraging employees to wear warm clothing in winter),
- Reducing excessive use of air conditioning and heating in office spaces. Encouraging reorganization of offices, e.g. by putting unused rooms out of operation or giving up one of several kitchens/fridges,
- Using blinds in offices with sufficient access to daylight, which will reduce the consumption of energy needed to cool rooms on hot days,
- Limiting the possibility of opening windows in offices (if any) without adjusting indoor air parameters accordingly.

## Water and waste

- Incentives for office space tenants to run only a full dishwasher and not to wash dishes by hand if there is a dishwasher in the kitchen,
- Incentives for office space tenants' employees to reduce water consumption - installing aerators on faucets, turning off water while applying soap on hands.



# OPERATIONAL ISSUES - GENERAL ISSUES

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- Conducting test of electric fire pumps only during off-peak hours,
- Extending the quiet hours - muting music, reducing light intensity, turning off the advertising in tenants' windows, on billboards and screens in office areas),
- Locking the heating control in common areas so that third parties cannot arbitrarily change the pre-set temperature,
- Shortening the opening hours for selected tenants or the entire facility.







## **8. ACTIVITIES IN RELATIONS WITH TENANTS**

# MEASURES TO BE TAKEN WITH REGARD TO TENANTS

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Tenants of commercial buildings operate based on lease agreements, which regulate, among other things, many issues related to energy consumption and access to the premises (sometimes 24/7). In view of rising energy prices, experts recommend revising selected contractual provisions and adjusting them to the new situation.



MEASURES TO BE TAKEN WITH REGARD TO TENANTS

# MEASURES TO BE TAKEN WITH REGARD TO TENANTS

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- Informing the tenants of actions taken by the administrator and their consequences for the tenants' operation,
- Preparing, together with tenants, individual electricity savings plans,
- Arranging with tenants for dimming the lighting after closing their premises and switching the lighting off completely after 10:00 pm OR arranging for "siesta" hours, i.e. turning the heating and HVAC down or off during electricity consumption peaks (at noon),
- Arranging with tenants for dimming the illumination of their logos inside and outside the building - around the clock or after closing the centre,
- Amendments to ZPTA provisions requiring the use of LED lighting,
- Amendments to ZPTA provisions regulating the intensity of lighting in the premises,
- Prohibiting the use of additional heating or cooling appliances and low-energy efficiency equipment,
- Including in lease agreements a provision requiring dimming the illumination of logos after closing time.





# **9. GREEN**

## **SOLUTIONS AND PHOTOVOLTAICS**

# GREEN SOLUTIONS AND PHOTOVOLTAICS

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Alternative energy sources are an increasingly interesting topic for facility owners and managers. However, in addition to photovoltaics, experts recommend other forms of energy optimization and their application to existing buildings where possible.



GREEN SOLUTIONS AND PHOTOVOLTAICS

# GREEN SOLUTIONS

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- Increasing the amount of climbing plants to reduce temperatures, for example, the use of ivy inside and outside the building,
- Using green areas next to the building as natural wastewater treatment plants,
- Collecting and using rainwater for watering plants, flushing waste water,
- Installing solar collectors for heating domestic water for toilets, for the cleaning company and for the social rooms,
- White roofs - thermal insulation with technologies that increase the thermal insulation of the facility,

- Use of additional layers on the roof - light roofing paper, membranes,
- Analysing the possibility of installing photovoltaic panels on roofs,
- Designing new facilities with sufficient space for installation of photovoltaic panels, heat pumps, submersible pumps.





# **10. DESIGNING NEW FACILITIES AND LONG-TERM STRATEGIES**



# DESIGNING NEW FACILITIES AND LONG-TERM STRATEGIES

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There are different types of commercial facilities in Poland - the oldest ones are more than two decades old, and new ones are built every year. Some changes related to optimizing energy consumption are only possible during the construction or modernization of a facility, but in the long term, these types of investments can be profitable.

DESIGNING NEW FACILITIES  
AND LONG-TERM STRATEGIES



# DESIGNING NEW FACILITIES AND LONG-TERM STRATEGIES

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- Changing property design criteria, e.g., by maintaining constant CO<sub>2</sub> levels in facilities instead of periodical air exchange,
- Designing the roofs of buildings such as to allow installation of photovoltaic panels thereon,
- Designing buildings to include skylights and extensive use of daylight,
- Adding vestibules at all entrances,
- Obligation to design installations in tenants' premises divided into sections having assigned priorities,
- Replacing air handling units and refrigeration devices with higher energy efficiency ones + heat pumps,
- Improving the tightness of doors, windows, gates,
- Returning to Sunday shopping to spread footfall and energy consumption more evenly.

# DESIGNING NEW FACILITIES AND LONG-TERM STRATEGIES

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- Upgrading open-air parking lots by adding roofs on which photovoltaic panels can be installed,
- Designing roofs and walls of buildings allowing the use of PV systems (including outdoor areas),
- Installing water-efficient taps, urinals and flush toilets,
- Designing lighting systems with more circuits to allow better control of switching on/off lighting that is not needed during the day or a given season.

# EUROPE GEARS UP FOR WINTER

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**The European Commission has called on EU countries to reduce energy consumption by 15 percent by March 31, 2023, compared to the average consumption of the past five years. This means, among other things, reducing indoor temperatures to 19° C in winter, and air conditioning to 25° C in summer. The EU countries are planning to comply with the guidelines, and some are introducing their own restrictions. Here are some of them:**

**Germany** - from Sept. 1 to Feb. 28, store doors in Germany may not be kept permanently open. Some lands plan to lower night temperatures to 17° C and provide hot water only during selected hours. In public buildings (excluding schools and hospitals), hallways will not be heated and water for hand washing will not be heated.

**France** - Air conditioning in buildings should be set to 26° C, while heating to 19° C. Paris' urban monuments have been lit until 10 p.m. since September 23, and the water temperature in swimming pools has been lowered by 1 degree. It has been recommended that the temperature at workplaces and entertainment facilities should be kept at 16-17 degrees when empty. In addition, there will be a ban on illuminating storefronts and street advertisements at night.

**Spain-** by the end of September, any air-conditioned or heated premises must have an automatic door-closing mechanism. In winter, the maximum temperature in public buildings must not exceed 19° C, and storefronts must not be illuminated after 10 p.m.

**Greece** - Greece recently saw a situation where RES covered all of the country's energy needs. Still, the Greek government is urging citizens to conserve energy. Light fixtures in some cities will be replaced with LEDs. The authorities have also ordered the appointment of “energy consumption observers” - employees whose task is to ensure energy conservation in public institutions.

**Finland** - a campaign to encourage reduction in energy consumption has been scheduled for October.

**Denmark** - as of October 1, the temperature in public buildings was to be lowered to 19° C (except for schools, hospitals and nursing homes).

**Czech Republic** - The Czech government sets maximum prices for electricity and gas, Czech PM has announced actions aimed at energy conservation in public buildings, including replacing the existing lighting with LEDs.

# EUROPE GEARS UP FOR WINTER



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# CONTACT

---



**POLSKA RADA  
CENTRÓW HANDLOWYCH**  
POLISH COUNCIL  
OF SHOPPING CENTRES

## **Polish Council of Shopping Centers**

Anna Niemira-Jurek

E-mail: [ajurek@prch.org.pl](mailto:ajurek@prch.org.pl)



Polska Izba Nieruchomości Komercyjnych

## **Polish Chamber of Commercial Real Estate Association**

Agnieszka Jachowicz

E-mail: [agnieszka.jachowicz@stowarzyszeniepink.org.pl](mailto:agnieszka.jachowicz@stowarzyszeniepink.org.pl)