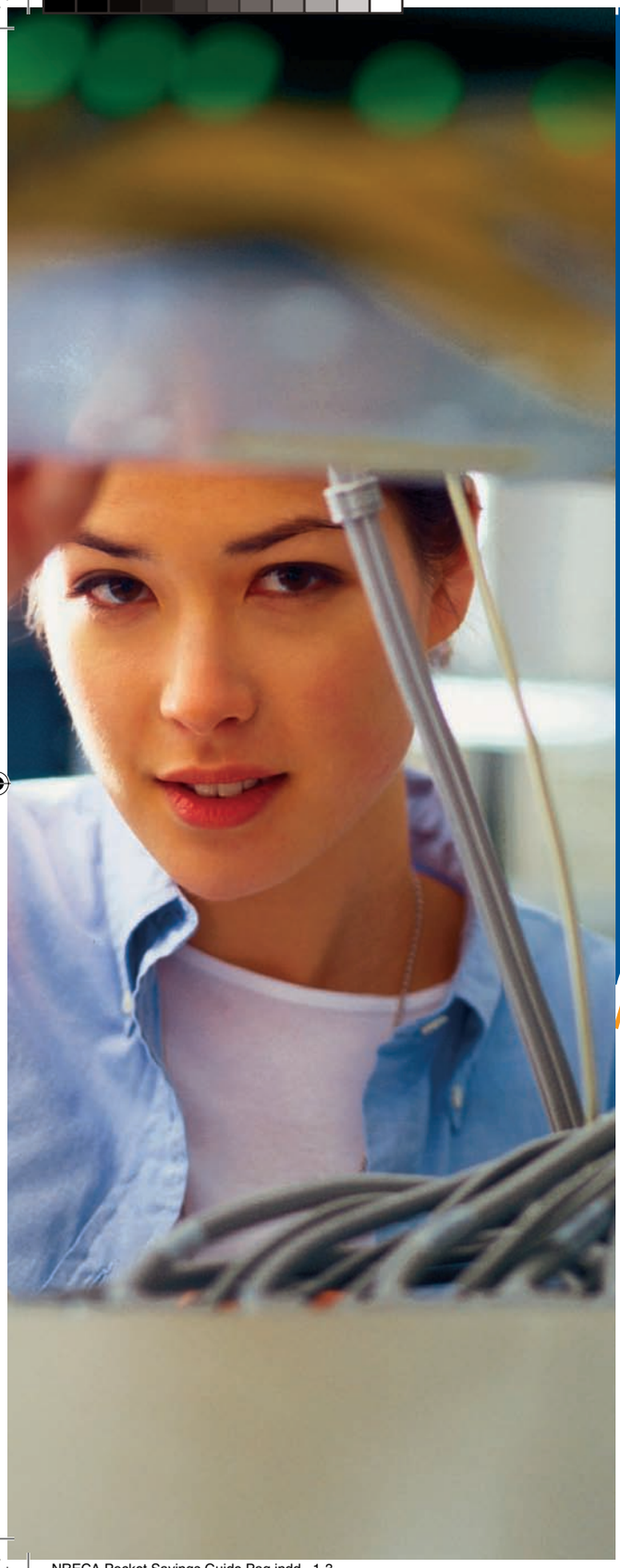

Commercial Energy Savings Guide

Touchstone Energy® Cooperatives

The power of human connections®

www.touchstoneenergy.coop

Commercial Energy Saving Tips

This guide provides basic hints on ways to reduce energy costs for business customers. All Touchstone Energy cooperatives strive to provide the best possible service and to help member owners save money through the efficient use of energy. Please contact your local Touchstone Energy cooperative for more information.

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Tip 1: Check Your Rate

- Even if you were on the correct rate last year, things can and do change.
- If your operating hours change, or you add equipment or other load, your electric usage profile will change. A different rate could save money.
- Your electric provider may have added rates that are more suitable for your usage profile and could save your business money.
- Review your operation's usage pattern. A change in when you operate can result in savings on your utility bill.

Tip 2: Maintain Your HVAC Systems

HVAC equipment that is properly maintained will use less energy and enjoy a longer life. The greatest cost associated with an unscheduled HVAC breakdown may be in lost production - NOT in the repair cost.

- Keep indoor/outdoor coils and filters clean.
- Ensure that your HVAC system circulates the correct airflow.
- Lubricate. Check electrical connections and pulleys.
- Maintain correct refrigerant charge.
- Minimize duct leakage.
- Provide adequate ventilation in compliance with local applicable standards.
- Minimize HVAC runtime while facility is closed.
  - Protect temperature-sensitive materials.
  - Manage recovery if your facility is on a demand rate.

Notes:

Insulation terms

- U value: U is a value that expresses the number of BTU that will conduct through a combination of building materials sandwiched together per hour, per square foot, per degree difference from side to side.
- R Value: A measure of the capacity of a material to resist heat transfer; the reciprocal of U value.
- 1/U = R; 1/R = U
- You can add R-values.
- You cannot add U values; you can however convert U values to R values, add them and then convert the total R value back to a U value.
- Once R values approach 20, payback on additional insulation slows significantly.

Electrical Terms

- **Volt** - A unit of electrical force equal to that amount of electromotive force that will cause a steady current of one ampere to flow through a resistance of one ohm.
- **Ampere** - A unit of measure for an electrical current; the amount of current that flows in a circuit at an electromotive force of one volt and at a resistance of one ohm.
- **VA** = Volts x Amps
- **KVA** = (Volts x Amps) / 1000
- **Watts** = Volts x Amps x Power Factor (Single Phase)
- **Watts** = Volts x Amps x Power Factor x 1.73 (Three Phase)
- **Power Factor** - The ratio of actual power being used in a circuit, expressed in watts or kilowatts, to the power that is apparently being drawn from a power source, expressed in volt-amperes or kilovolt-amperes.
  - Electric resistance lamp:
    117.5 volts x 0.31 amps = 36 VA, 36 watts
    (36 watts / 36 VA = 100% Power Factor)
  - Electric compact fluorescent lamp:
    117.8 volts x 0.16 amps = 19 VA, 12 watts
    (12 watts / 19 VA = 63% Power Factor)
- **KWH** - A unit or measure of electricity supply or consumption of 1,000 Watts over the period of one hour, or 100 watts over 10 hours; equivalent to 3,413 Btu.
- **KW** - A standard unit of electrical power equal to one thousand watts. A unit of demand.

Tip 3: Ventilate Properly

- Meet OSHA standards for occupancy numbers.
- Kitchens should run at a slightly negative pressure.
- Bathroom ventilators should be off when building is closed – if permissible with local codes.
- Ensure make-up air is drawn from an appropriate location. (For example, don't pull from a dumpster area.)
- Ensure that kitchens have adequate air circulation.
- Do not over-ventilate. It is a waste of energy.

Tip 4: Water Heating

- Locate water heaters for most efficient delivery.
- Insulate water heaters.
- Ensure that the heating temperature is correct based on local requirements.
- Control water heaters based on actual periods of need during the day.
- Explore opportunities for heat recovery.
- Be familiar with your state's Board of Health requirements before making any changes that could affect hot water delivery temperatures. For example:
  - There are strict requirements for MINIMUM and MAXIMUM water temperatures for nursing homes.
  - There are strict requirements for MINIMUM water temperatures for manual and automated dishwashing in retail food establishments.

Tip 5: Refrigeration

- Clean refrigeration coils regularly.
- Doors and seals on walk-in units should be kept in good repair.
- Make sure that refrigeration units are properly charged with refrigerant.
- Ensure units are properly defrosting. Check for ice buildup.

Clocking an Electric Meter

This is a useful tool to allow you to check your usage at different times of the day without any specialized equipment.

$$KW = \frac{3.6 \times K_H \times \text{Meter Multiplier} \times \text{Revolutions}}{\text{Seconds}}$$

Meter Multiplier is shown on meter or available from utility. Many meters show KH. On electronic meters, count the LED movements across the screen.

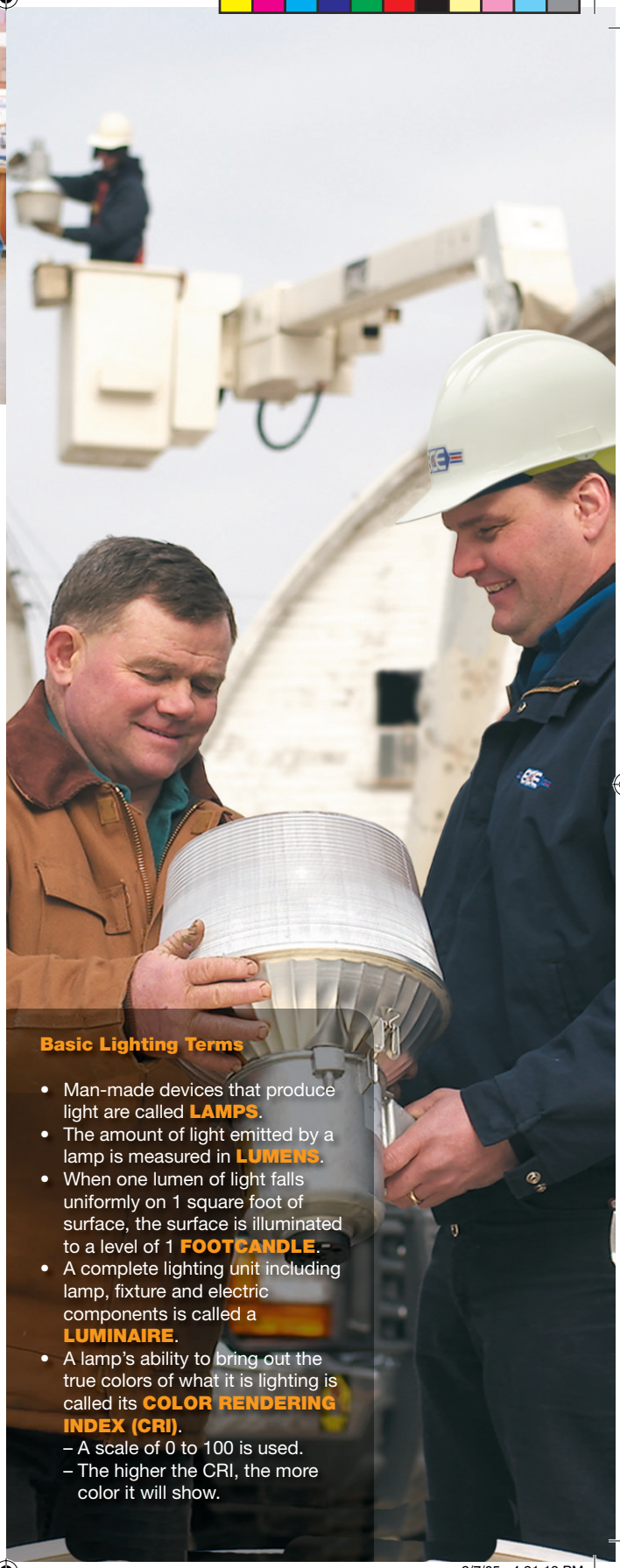
Tip 6: Indoor Lighting

- Depending on your electric rate and hours of operation, switching from magnetically ballasted T-12 fluorescent lamps to electronically ballasted T-8 lamps may save. (T-12 = 1.5" in diameter, T-8 = 1" in diameter)
- Consider switching from incandescent to compact fluorescent in canisters.
- Consider LED exit lighting instead of incandescent.
- Assess lighting levels after closing and explore opportunities to reduce lighting levels in other areas of your business. It may be more than you need.
- Group re-lamping may save on labor costs when compared to spot re-lamping.
- Explore opportunities to switch to high-pressure sodium or metal halide lighting in warehouses.

Tip 7: Outdoor Lighting

- Make sure lighting is adequate for safety.
- Make sure lighting timers are set only for hours needed.
- Consider using sun trackers or photocells in conjunction with electronic timers on outdoor lighting.
- Evaluate converting incandescent or mercury vapor lighting to high-pressure sodium or metal halide lighting.
- Ensure adequate turn-in lighting off of the highway.

The best source of outdoor lighting design, installation and maintenance may be your electric cooperative.



Basic Lighting Terms

- Man-made devices that produce light are called **LAMPS**.
- The amount of light emitted by a lamp is measured in **LUMENS**.
- When one lumen of light falls uniformly on 1 square foot of surface, the surface is illuminated to a level of 1 **FOOTCANDLE**.
- A complete lighting unit including lamp, fixture and electric components is called a **LUMINAIRE**.
- A lamp's ability to bring out the true colors of what it is lighting is called its **COLOR RENDERING INDEX (CRI)**.
  - A scale of 0 to 100 is used.
  - The higher the CRI, the more color it will show.

Tip 8: Motors
(operating hours over 2,000/year)

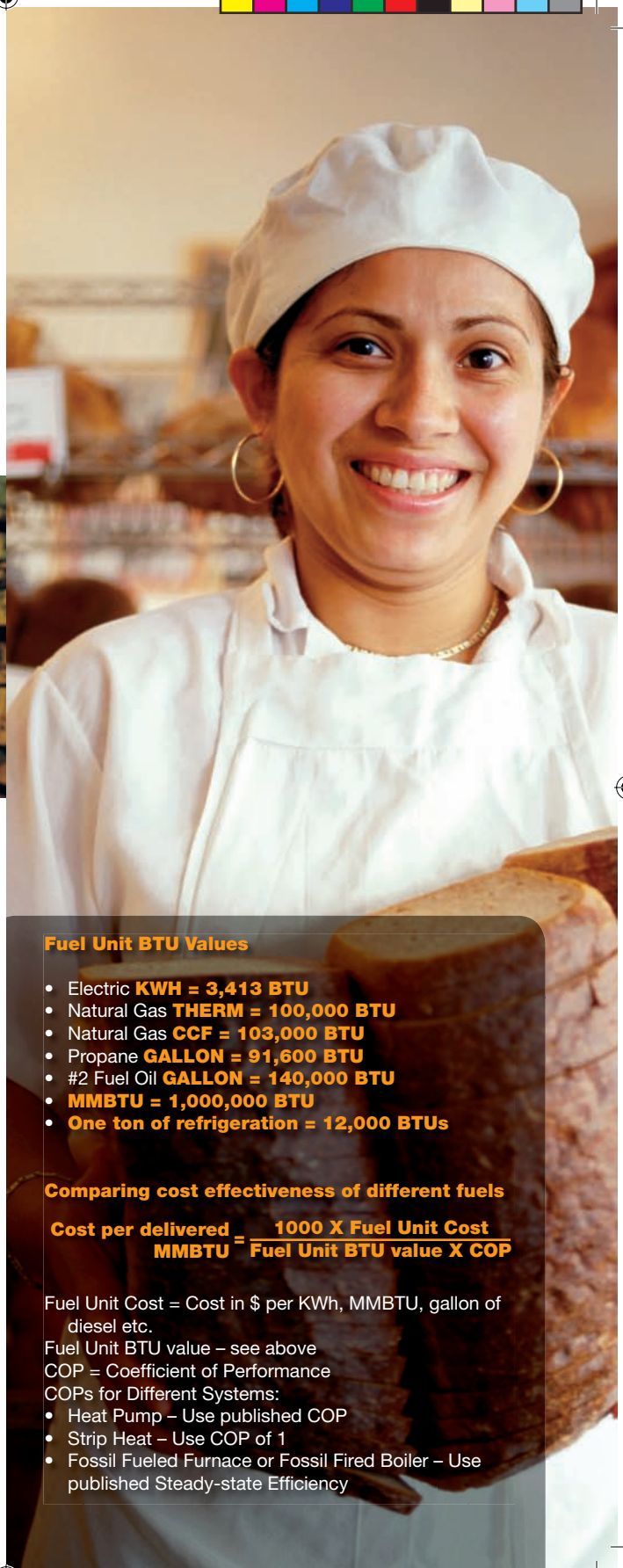
- Manage motors with long run times to save energy cost.
- Replace motors under 25 hp with energy efficient motors vs. rewinding them.
- Depending on the run time, buying a new energy efficient motor can pay for itself in energy savings and may last longer than the rewound motor.
- Size loads properly for the job. Oversized motors will use more energy than properly sized motors.

Tip 9: Due Diligence is Essential

All that glitters is not gold, and everything a salesperson tells you will not necessarily save you money. Asking a few good questions can save you the grief of causing more problems than you cure with new technologies.

Questions to ask a product vendor or supplier:

- Is it UL approved?
- Do you have a letter from the manufacturer stating no equipment warranties will be voided?
- Do you have reports from credible sources (ASHRAE, IES, DOE, Lawrence Berkeley National Labs) supporting the product's effectiveness?
- Can you provide the names of 10 companies, with contacts and phone numbers, who have used your product for a year or more and who will attest to its effectiveness?
- How long has your company been selling this product?



Fuel Unit BTU Values

- Electric **KWH = 3,413 BTU**
- Natural Gas **THERM = 100,000 BTU**
- Natural Gas **CCF = 103,000 BTU**
- Propane **GALLON = 91,600 BTU**
- #2 Fuel Oil **GALLON = 140,000 BTU**
- **MMBTU = 1,000,000 BTU**
- **One ton of refrigeration = 12,000 BTUs**

Comparing cost effectiveness of different fuels

$$\text{Cost per delivered MMBTU} = \frac{1000 \times \text{Fuel Unit Cost}}{\text{Fuel Unit BTU value} \times \text{COP}}$$

Fuel Unit Cost = Cost in $ per KWh, MMBTU, gallon of diesel etc.
Fuel Unit BTU value – see above
COP = Coefficient of Performance
COPs for Different Systems:

- Heat Pump – Use published COP
- Strip Heat – Use COP of 1
- Fossil Fueled Furnace or Fossil Fired Boiler – Use published Steady-state Efficiency