

Saving Money in HVAC Systems

Rod Rhoads, Energy Advisor, GDS Associates, Inc. an ActOnEnergy Partner

Mary Bentsen, Training Coordinator, SAIC an ActOnEnergy Partner



ActOnEnergy.com

Quiz Questions – What do you already know about energy-efficiency in HVAC systems?

1. What percent of a commercial business's energy usage comes from their HVAC system?
2. How much money do commercial facilities spend per square foot on energy costs annually?
3. How do you determine whether it's time to tune-up or replace new equipment?

1. What percent of a commercial business's energy usage comes from their HVAC system?

- A. 13%
- B. 23%
- C. 33%**
- D. 43%
- E. 53%

2. How much money do commercial facilities spend per square foot on energy costs annually?

- A. \$0.49
- B. \$0.59
- C. \$0.79
- D. \$1.19**
- E. \$2.19

3. How do you determine whether it's time to tune-up or replace new equipment?

- A. Always replace older equipment with new, more energy-efficient equipment
- B. Replace any equipment that is more than 15 years old
- C. Replace older equipment when there is a rebate available
- D. Look at payback times to see if it's worth your investment**

Today's Topics



No "TLC" is Bad for Energy Savings



Tune-up vs. Replacement



Types of HVAC Systems



ActOnEnergy Cash Incentives Available to Help

Today we're going to talk about energy-efficiency best practices in HVAC, tune-up of equipment vs. replacement, the benefits and features of the different types of HVAC systems, and what energy saving projects qualify for ActOnEnergy cash incentives. The information presented today will help you identify HVAC energy reduction projects and how to save money on your energy bills.

ActOnEnergy Incentive Areas

Lighting

HVAC & Water Heaters

Variable Frequency Drives
(VFD)

Process Steam/Steam Traps

Retro-Commissioning

Custom Electric and Gas

To get to the Online Store, type:
www.ActOnEnergy.com/businessonlinestore
into your browser.

Ameren Illinois' ActOnEnergy program offers cash incentives to customers to be more energy-efficient. Energy-efficient upgrades not only lower your energy bills, they can also reduce maintenance costs, improve comfort, provide precise control and extend equipment life. The Ameren Illinois' ActOnEnergy initiative helps businesses use less energy and save more money.

The ActOnEnergy programs include electric and gas incentives, where the incentive is paid to you after you complete the project. There are also energy-saving products available at the ActOnEnergy Online Store, where the incentive is built into the price. The Online Store is located at www.ActOnEnergy.com/businessonlinestore.

No “TLC” is Bad for Energy Savings

- No regular service + aging equipment = loss of savings!
- Fossil fuels equipment need annual care
- AC condenser coils and environment
- Boilers operate for years, but time moves on!
- New tech advances help pay for change



Now, I'm going to explain why it's important to maintain your HVAC equipment and replace it when necessary.

There are two main ways to make sure your heating, ventilation, and cooling systems are using energy efficiently: to maintain your equipment with annual tune-ups, and to replace old equipment when it's time.

- No regular service plus aging equipment equals loss of savings!
- Fossil fuels equipment need annual care
- AC condenser coils and environment
- Boilers operate for years, but time moves on!
- New tech advances help pay for change

Tune-up Time

- Tune-up of HVAC is vital to saving energy
- Prevent downtime and bigger repair cost
- Schedule tune-up annually (Spring/Fall)



Now, I'm going to explain the importance of tune-ups.

- Tune-up of HVAC is vital to saving energy
- Prevent downtime and bigger repair cost
- Schedule tune-up annually (Spring/Fall)

The ActOnEnergy program offers cash incentives for tune-ups, and I'll be telling you more about this later in the presentation.

A typical maintenance check-up should include the following:

- Check thermostat settings
- Tighten all electrical connections
- Lubricate all moving parts
- Check and inspect the condensate drain
- Check controls of the system



A typical maintenance check-up should include the following:

Check thermostat settings to ensure the cooling and heating system keeps you comfortable when your facility is open and saves energy when it is closed.

Tighten all electrical connections and measure voltage and current on motors. Faulty electrical connections can cause unsafe operation of your system and reduce the life of major components.

Lubricate all moving parts. Parts that lack lubrication cause friction in motors and increase the amount of electricity you use.

Check and inspect the condensate drain in your central air conditioner, furnace and/or heat pump (when in cooling mode). A plugged drain can cause water damage in your facility and affect indoor humidity levels.

Check controls of the system to ensure proper and safe operation. Check the starting cycle of the equipment to assure the system starts, operates, and shuts off properly.

Heating-Specific Maintenance Check-up

- ✓ Check all gas connections for leaks
- ✓ Gas pressures adjusted to proper levels
- ✓ Clean burners and heat exchanger
- ✓ Reset and check for leaks, proper operation
- ✓ Check temperature rise/air flow



Now, let's move on to talk about best practices specific to maintenance of heating equipment.

Maintenance check-ups for heating systems should include:

- Check all gas connections for leaks
- Gas pressures adjusted to proper levels
- Clean burners and heat exchanger
- Reset and check for leaks, proper operation
- Check temperature rise/air flow

Cooling-Specific Maintenance Check-up

- ✓ Clean evaporator and condenser AC coils
- ✓ Clean and adjust blower airflow
- ✓ Check AC refrigerant levels/repair leaks
- ✓ Change filters regularly
SAVE money and equipment life increases



Now, let's move on to talk about best practices specific to maintenance of cooling equipment.

Maintenance check-ups for cooling systems should include:

- Clean evaporator and condenser AC coils
- Clean and adjust blower airflow
- Check AC refrigerant levels/repair leaks
- Change filters regularly to save money and increase equipment life
 - With standard filters, you should change monthly
 - Other types of filters are supposed to be changed quarterly or every 6 months
 - There are also washable filters
 - Ask your Program Ally how often you should be checking and changing your filters

Maintaining Ducts & More

- ✓ Clean and seal air ducts
- ✓ Thermostat operating properly
- ✓ Use programmable thermostats
- ✓ Regular filter changes



Now let's talk about proper duct maintenance considerations.

Maintenance check-ups for ducts should include:

- Clean and seal air ducts
- Thermostat operating properly
- Use programmable thermostats
- Regular filter changes

Time for New Equipment

- Repair or replace equipment
- Old efficiency versus what's now available
- Payback, new warranties, and new controls
- Rebates from a variety of sources
- Tax deductions



Now, I'll talk about how you can tell when it's time for new equipment.

- Repair or replace equipment
- Old efficiency versus what's now available
- Payback, new warranties, and new controls
- Rebates from a variety of sources
- Tax deductions

Cash Incentives for Tune-ups and Replacement!

- HVAC tune-ups for AC, gas furnaces and boilers
 - Cannot have had a tune-up agreement in the past year
- Replacements for gas customers
- Tune-ups for gas customers



HVAC tune-ups for AC, gas furnaces and boilers

- Cannot have had a tune-up agreement in the past year

Gas customers are eligible for boiler/furnace replacements

Gas customers are eligible for boiler/furnace tune-ups

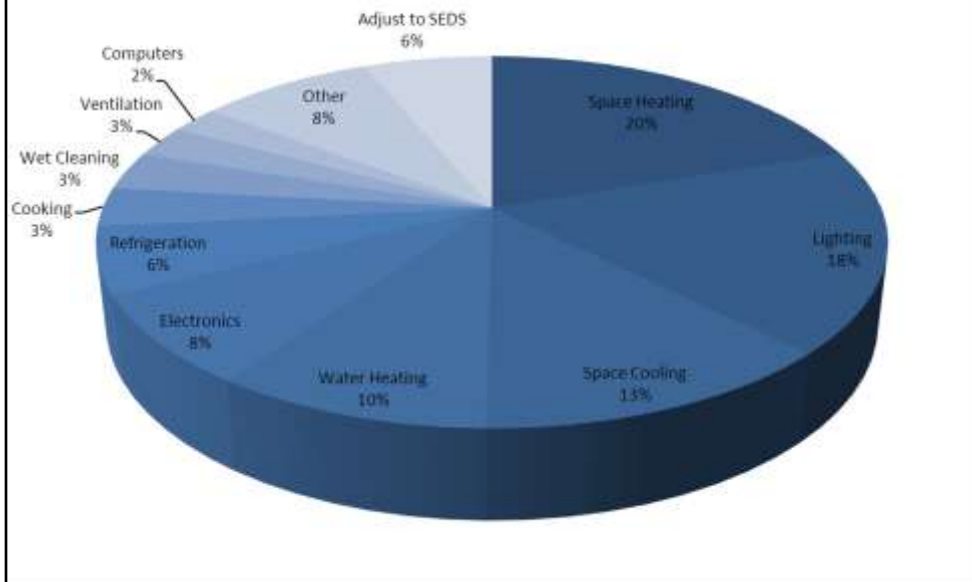
Now it's time for a quiz question.

Review Question:

What items should typical maintenance check-up include?

Please type your answers into the "Chat" window.

Commercial Energy Use



This chart shows how much energy is used in commercial facilities by heating and cooling. Space heating uses 20% of a commercial facility's energy usage, Space cooling uses 13%, and water heating uses 10%.

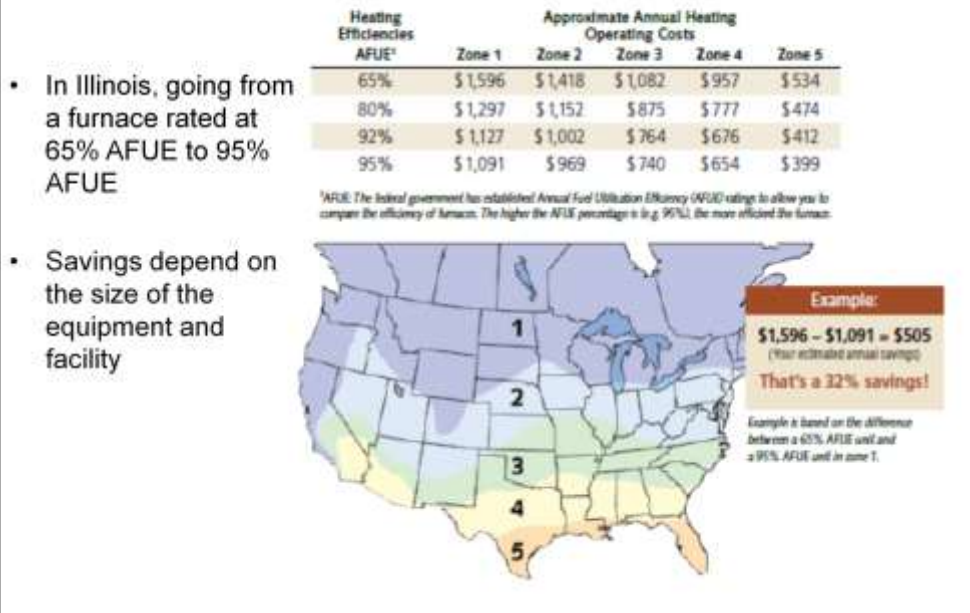
Heating and Your Business: Basic Facts

- 33% of a commercial business's energy usage comes from its HVAC system
- 30% of the energy usage comes from heating the air or water
- Commercial facilities spend \$1.19 per square foot on energy costs annually
- Hospitals spend \$2.26 per square foot on energy costs annually

The following statistics show why it's important to have equipment that is running efficiently.

- 33% of a commercial business's energy usage comes from its HVAC system
- 30% of the energy usage comes from heating the air or water
- Commercial facilities spend \$1.19 per square foot on energy costs annually
- Hospitals spend \$2.26 per square foot on energy costs annually

Examples of Potential Savings: Furnaces



Examples of potential savings for furnaces include:

- In Illinois, going from a furnace rated at 65% AFUE to 95% AFUE
- Savings depend on the size of the equipment and facility
- Since most of Illinois is in Zone 2, the savings can be quite significant when going from a furnace rated at 65% AFUE to 95% AFUE. In southern Illinois, being in Zone 3, the same can be said for the energy savings form a higher rated air conditioner.

Efficiency Ratings

Rating	Definition
AC	Air Conditioning 12,000btu = 1 Ton AC
SEER	Seasonal Energy Efficiency Ratio
EER	Energy Efficiency Rating
IEER	Integrated Energy Efficiency Ratio
IPLV	Integrated Part Load Value (chillers)
BTU	A basic measure of thermal (heat) energy. One BTU is the amount of energy needed to heat one pound of water one degree Fahrenheit

When replacing your heating or cooling unit, there are some terms you will want to be familiar with.

- AC : Air conditioning 12,000 btu equal 1 ton of AC in unit sizing of equipment.
- SEER: Seasonal Energy Efficiency Ratio
- EER: Energy Efficiency Rating More commonly used to rate commercial equipment or 3 phase powered units. 3 lines of power and a neutral.
- IEER: Integrated Energy Efficiency Ratio
- IPLV: Integrated Part Load Value (chillers)
- BTU: a basic measure of thermal (heat) energy. One BTU is the amount of energy needed to heat one pound of water one degree Fahrenheit
- Another example for a Btu is one match is roughly equivalent to one Btu

Types of Systems

Type	Features
Heat	Electric, gas or a heat pump
AC	Number of energy ratings available
Rooftop (package unit)	Combine heat and AC
Split systems	Separate heat and AC components
Boilers	Hot water or steam
Geothermal heat pump	Package or split
Mini splits	PTAC/PTHC, high velocity AC
Hot Water heaters	Tank or tankless

The types of systems include:

- Heat can be electric, gas or a heat pump
- AC : Number of energy ratings available
- Rooftop (package unit) combine Heat and AC
- Split systems: separate components=system
- Boilers: hot water or steam
- Geothermal heat pump package or split
- Mini splits, PTAC/PTHC, high velocity ac
- Hot Water heaters: tank & tank less

Rooftop

AC :

- SEER 5 ton & below
- EER used above 5 ton
- Staging available AC
- Industry standards will go higher

Heat:

- Gas, Electric, Heat pump
- Gas furnace with 80% AFUE
- Staging available Heat



For rooftop systems:

AC :

SEER 5 ton & below

EER used above 5 ton

Staging available AC. Many rooftops are now available with only 50 to 60% of capacity coming on first to see if this will satisfy the load of cooling needed and if not then bring on the rest of capacity available. This saves energy by not using the all or nothing approach of the old units.

Industry standards will go higher

Heat:

Gas, Electric, Heat pump

Gas furnace with 80% AFUE

Staging available Heat. The same staging principle of cooling we talked about also applies to the heating side to save energy for gas and electric heating units.

Chillers and More

- Chiller advancements
- VFD's to chiller and motors
- New software



Chiller advancements
VFD's to chiller and motors
New software

Split System

- Mix and match components
- Flexibility to use dual fuel
- Adaptable to space and situations
- Best control of goals



This is a picture of a split air conditioning unit.

Split Systems:

- Mix and match components
- Flexibility to use dual fuel
- Adaptable to space and situations
- Best control of goals, this allows you to match the needs of the budget on equipment cost/operation and comfort goals of the space you are trying to condition with heating or air conditioning.



Split System

Split furnace

Here's a picture of a split furnace.

What type of HVAC system(s) do you have
at your business?

Select all that apply.

What type of HVAC system do you have at your business? Select all that apply.

- A. Gas boiler
- B. Gas furnace
- C. Split system
- D. Rooftop unit
- E. Mini split

Geothermal

- Ground source heat pump
- Water circulated to heat and cool air from wells, ground loops, or bodies of water
- Package and split systems



Geothermal systems:

- Ground source heat pump
- Water circulated to heat and cool air from wells, ground loops, or bodies of water
- Package and split systems

Boilers Shrinking



Boilers:

- High tech boilers are becoming smaller & smarter
- AFUE ratings of 90% or greater
- New boilers have modulating valves, allow for the staging of multiple, smaller boilers, and can be controlled by computer software

Optimizing Your System

- Install a VFD on AC motors/pumps
- Install DC-powered motors and controls
- Multi-staged heat and ac equipment
- Install upgraded gas valves on heating equipment



Ways to optimize your system include:

- Install a VFD on AC motors/pumps
- Install DC-powered motors and controls This option is for some smaller commercial equipment in recent years.
- Multi-staged heat and ac equipment- The equipment will have the ability to turn on a percent of it's overall capacity depending on what is called for by demand conditions or weather. This feature will be available on **many new** equipment models.
- The longer the anticipated time in a facility, the more critical it is to have the most efficient HVAC unit.

Optimizing Your System: Quality Installation



For quality installation, you should know the following:

New equipment does not have factory presets for your business

- General settings need to be adjusted to your business
- Fan speeds need to be adjusted to properly push air through ductwork
- Heating units also need to be adjusted, if not properly done, the heat exchanger could be cooked

Not adjusting the settings properly could:

- Cause premature equipment failure
- Void manufacturers warranty

Is Equipment Properly Sized?

- ✓ Have your heat load evaluated before agreeing to purchase and ask for a copy
- ✓ How are your windows, doors and amount of insulation in the walls and ceiling?
- ✓ If you are remodeling, tell your contractor
- ✓ This can affect your heat load and sizing of equipment
- ✓ Ask about equipment that stages heating and cooling. This will save energy all year long



To make sure you get the right-sized equipment:

- Have your heat load evaluated before agreeing to purchase and ask for a copy
 - To have your heat load evaluated, ask an engineer or your HVAC contractor to run a software program to determine what size equipment best fits your needs. The software program takes into account the size of the facility, the condition of the insulation, age and type of doors and windows, amount of glass facing each direction, and other factors. The factors are plugged into the software program and it tells you what size equipment would work best to heat or cool the facility.
- How are your windows, doors and amount of insulation in the walls and ceiling?
- If you are remodeling, tell your contractor
- This can affect your heat load and sizing of equipment
- Ask about equipment that stages heating and cooling. This will save energy all year long

What Qualifies for ActOnEnergy Cash Incentives

Type	What Qualifies
Furnaces	At least 90% AFUE; more \$ for 92+%
Boilers	85% AFUE or 90% TE, depending on size
AC and HP (up to 5 tons)	At least 14 SEER; more \$ for 15+ SEER
AC or HP (5+ tons)	Depends on size and EER/IPLV
Tune-ups	Use the HVAC Application
Water Heaters	Use the HVAC Application
Geothermal	Must use the Custom Application

The following equipment qualifies for ActOnEnergy cash incentives:

Furnaces: At least 90% AFUE; more \$ for 92+%

Boilers: 85% AFUE or 90% TE, depending on size

AC and HP (up to 5 tons): At least 14 SEER; more \$ for 15+ SEER

AC or HP (5+ tons): Depends on size and EER/IPLV

Tune-ups: use the HVAC Application

Water Heaters: use the HVAC Application

Geothermal: Must use the Custom Application

ActOnEnergy Incentives for Cooling



Fixed incentives for the following high efficiency equipment:

Type	Cash Incentives Available
Unitary and split air conditioning systems, and air source heat pumps	There are two tiers of cash incentives available based on capacity and efficiency: \$15 per ton or \$60 per ton
Air-cooled chiller	\$20 per ton
Room air conditioners	Cash incentives are available in two tiers: \$25 per ton and \$60 per ton
PTAC/PTHP	\$15 per ton

Use the HVAC Application to apply for these cash incentives.

Fixed incentives are available for the following high efficiency equipment:

- Air conditioners
- Air Source Heat Pumps
- Air-Cooled Chillers (use HVAC application)
- Water cooled chiller (use custom application)
- Room air conditioners (window units)
- PTAC/PTHP Units (hotels and motels)
- Variable frequency drives on HVAC motors

Use the HVAC Application to apply for these cash incentives.

For unitary and split air conditioning systems, and air source heat pumps, there are two tiers of incentives available based on capacity and efficiency: \$15 per ton or \$60 per ton.

For air-cooled chillers, the incentive is \$20 per ton installed.

For room air conditioners, there are two tiers of incentives available, based on capacity and efficiency: \$25 per ton and \$60 per ton installed

PTAC/PTHP incentives are \$15 per ton installed

ActOnEnergy Cash Incentives for Gas Furnaces

Cash incentives available for gas furnace replacement with ENERGY STAR qualified furnaces include:

- 90% AFUE = \$2.00 per kBtuh input
- 92% AFUE = \$2.50 per kBtuh input
- 94% AFUE = \$3.00 per kBtuh input



Use the HVAC Application to apply for these cash incentives.

Cash incentives available for gas furnace replacement include:

- ENERGY Star-qualified furnace (90% AFUE) = \$2.00 per kBtuh input
- ENERGY Star-qualified furnace (92% AFUE) = \$2.50 per kBtuh input
- ENERGY Star-qualified furnace (94% AFUE) = \$3.00 per kBtuh input

Use the HVAC Application to apply for these cash incentives.

ActOnEnergy Cash Incentives for Gas Boilers

Cash incentives available for gas boiler replacement include:

- Less than or equal to 300 kBtuh input: Minimum AFUE of 85% = \$1.00 per kBtuh input
- Greater than 300 kBtuh input: Minimum thermal efficiency of 90% = \$2.00 per kBtuh input

Use the HVAC Application to apply for these cash incentives.



Cash incentives available for gas boiler replacement include:

- Less than or equal to 300 kBtuh input: Minimum AFUE of 85% = \$1.00 per kBtuh input
- Greater than 300 kBtuh input: Minimum thermal efficiency of 90% = \$2.00 per kBtuh input

Use the HVAC Application to apply for these cash incentives.

ActOnEnergy Cash Incentives for Tune-ups

Cash incentives are available for tune-ups of AC units, gas furnaces and boilers.*

* Cannot have had a tune-up agreement in the past year

Use the HVAC Application to apply for these cash incentives.

Cash incentives of up to 50% of the tune-up cost, excluding replacement parts:

- Air conditioner: \$25 per ton cooling
- Air-cooled chiller: \$8 per ton
- Water-cooled chiller: \$4 per ton
- Gas boiler: \$0.25 per kBtuh input
- Gas forced-air furnace: \$0.25 per kBtuh input



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Use the HVAC Application to apply for these cash incentives

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Gas boiler: \$0.25 per kBtuh input

Gas forced-air furnace: \$0.25 per kBtuh input

ActOnEnergy Incentives: Water Heaters

For High-efficiency Equipment	
Type	Cash Incentive
Tanked Electric Water Heater	\$150 per water heater
Tankless Electric Water Heater	\$300 per water heater
Tanked Gas Water Heater	\$300 per water heater
Tankless Gas Water Heater	\$1200 per water heater
Condensing Tanked Water Heater	\$150 per water heater



Free products for eligible customers:

- Pipe insulation
- Faucet aerators
- Showerheads

Cash incentives for water heaters include:

High-efficiency Tanked Electric Water Heater

\$150 per water heater

High-efficiency Tankless Electric Water Heater

\$300 per water heater

High-efficiency Tanked Gas Water Heater

\$300 per water heater

High-efficiency Tankless Gas Water Heater

\$1200 per water heater

High-efficiency Condensing Tanked Water Heater

\$150 per water heater

Free products for eligible customers:

- Pipe insulation
- Faucet aerators
- Showerheads

Case Study: Boiler Tune-ups for Catholic Charities



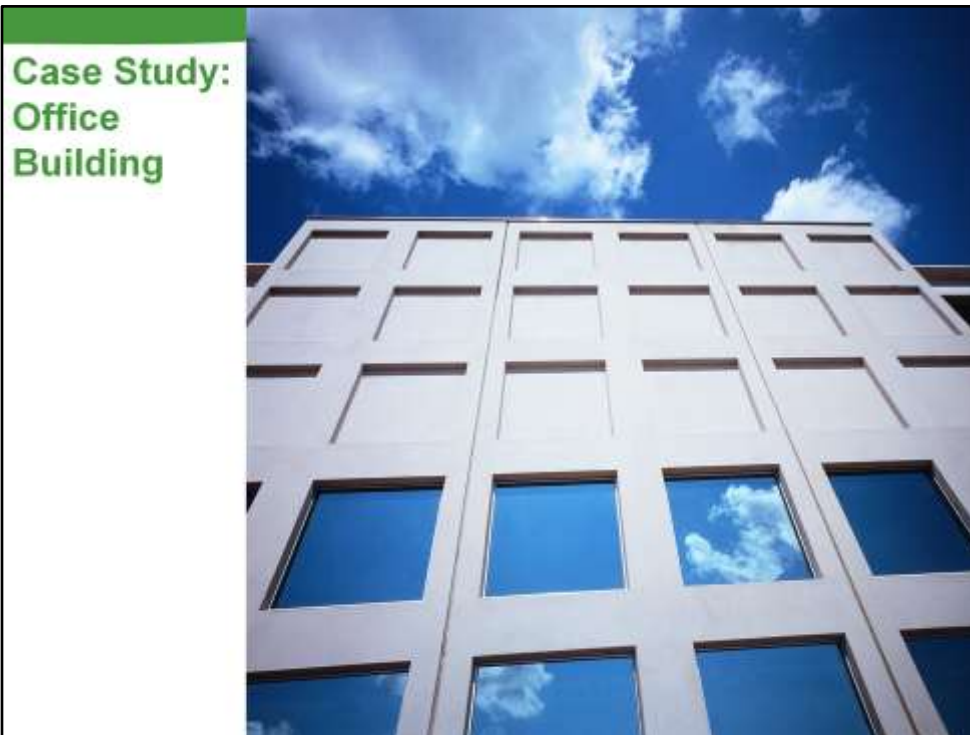
- Nearly \$1,750 in total cash incentives from ActOnEnergy
- Natural gas usage decreased by more than 2,000 therms annually
- Reduced maintenance costs
- Reduced risk of equipment breakdown and safety issues
- Every therm saved helps conserve precious natural resources
- Every dollar saved can go to the business, or in this case, the non-profit organization, to use for their programs

Now, let's take a look at a case study. Catholic Charities contacted ActOnEnergy to tune-up several boilers in their 100,000 square-foot 10-building complex in West Peoria.

Various enhancements were made to different units and they received nearly \$1,750 in total cash incentives from Act On Energy

- Natural gas usage decreased by more than 2,000 therms annually
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ActOnEnergy incentives typically pay up to 50% of the labor costs for tune-ups



At a 3 story office building, the owner replaced six boilers that were 18 years old with 3 high efficiency boilers. He also replaced 2 circulation motors with 2 new ones that are variable speed.

He replaced all old air control stats and controls in VAV boxes with electronic zone controllers and stats with software to control customize and set schedules so the system shuts down during unoccupied times. In addition, he replaced three 50 ton air conditioners on the roof with three units with scroll compressors and variable drive motors.

The total cost of the project was \$427,493.00. They received \$9150 in incentives for the air conditioners and controls and variable drive motors.

Now that ActOnEnergy is providing incentives for customers with a GDS-3 gas rate, they would have received \$3,600 in incentives for installing the boilers and saving 1,800 kbtuh.

ActOnEnergy Contacts

- Website: ActOnEnergy.com
- Phone: 1.866.800.0747
- Fax: 1.309.677.7950
- Email: ActOnEnergyBusiness@Ameren.com
- Rod Rhoads:
 - rod.rhoads@gdsassociates.com or 1.217.649.8897
- Jenny Bethel – Program Ally Coordinator:
 - jbethel@ameren.com or 1.309.677.7951

There are several ways to get information about the ActOnEnergy program:

Website: ActOnEnergy.com

Phone: 1.866.800.0747

Fax: 1.309.677.7950

Email: ActOnEnergyBusiness@Ameren.com

Rod Rhoads:

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Quiz Questions – What do you already know about energy-efficiency in HVAC systems?

1. What percent of a commercial business's energy usage comes from their HVAC system?
2. How much money do commercial facilities spend per square foot on energy costs annually?
3. How do you determine whether it's time to tune-up or replace new equipment?

Now it's time to take the final quiz to see what you learned today. These are the same questions you saw at the beginning of the presentation. I will give you a moment to submit your answers. Once you have chosen your answers, click the submit button. You'll have about a minute to submit your responses.

1. What percent of a commercial business's energy usage comes from their HVAC system?

- A. 13%
- B. 23%
- C. 33%**
- D. 43%
- E. 53%

2. How much money do commercial facilities spend per square foot on energy costs annually?

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Questions?

