

ATTACHMENT 7 – DISADVANTAGED COMMUNITY

100% of the measurable benefits of the decrease in utility service bills for the Santa Ana River Watershed's Water-Energy Community Action Network (WE CAN) Program will be directly provided to Disadvantaged Community (DAC) residents as the water-energy saving retrofits discussed in Attachment 3 Work Plan will be implemented for residents who meet the following criteria.

Dwell in a single family detached home located in:

- A 76% or higher scoring CalEnviroScreen 2.0 census tract;
- A 2005 Southern California Association of Governments (SCAG) Single Family Residential Land Use tract; and
- The Santa Ana River Watershed.

The SCAG data allows for the tracking of homes that are single family detached units, where residents are charged a monthly water-energy bill based on their individual meter. Thus any efficiency savings accrue directly to them, as opposed to the process for a condominium or apartment, which often aggregates the individual monthly water-energy bills for the complex, and charges each resident a proportionate share of the overall complex's bill.

The project will also be constructed and physically located in the boundaries of the 76% or higher scoring census tracts as the Program is focused on retrofitting addresses within those tracts.

These retrofits, such as replacing high water using turf and light fixtures discussed in Attachment 3, will be constructed at no cost to the resident. Thus any dollar savings from the retrofit would immediately go toward the resident, instead of going toward the gradual payment of the retrofit. Some of these savings include:

- Turf replacement with drought tolerant landscaping: \$662 estimate yearly bill saving (Water Replenishment District Water Savings Calculator);
- Upgrade gas water heater: \$31 estimate yearly bill savings (U.S. Department of Energy, Home Energy Saver Report); and
- Replace standard thermostat with programmable thermostat: \$174 estimate yearly bill savings (U.S. Department of Energy, Home Energy Saver Report).

These dollar savings will provide DAC residents with immediate funds upon the first utility bill after installation of the retrofits. With these savings, DAC residents will have additional income for paying for transit, health care, food, rent/mortgage, etc.

Work Plan Summary

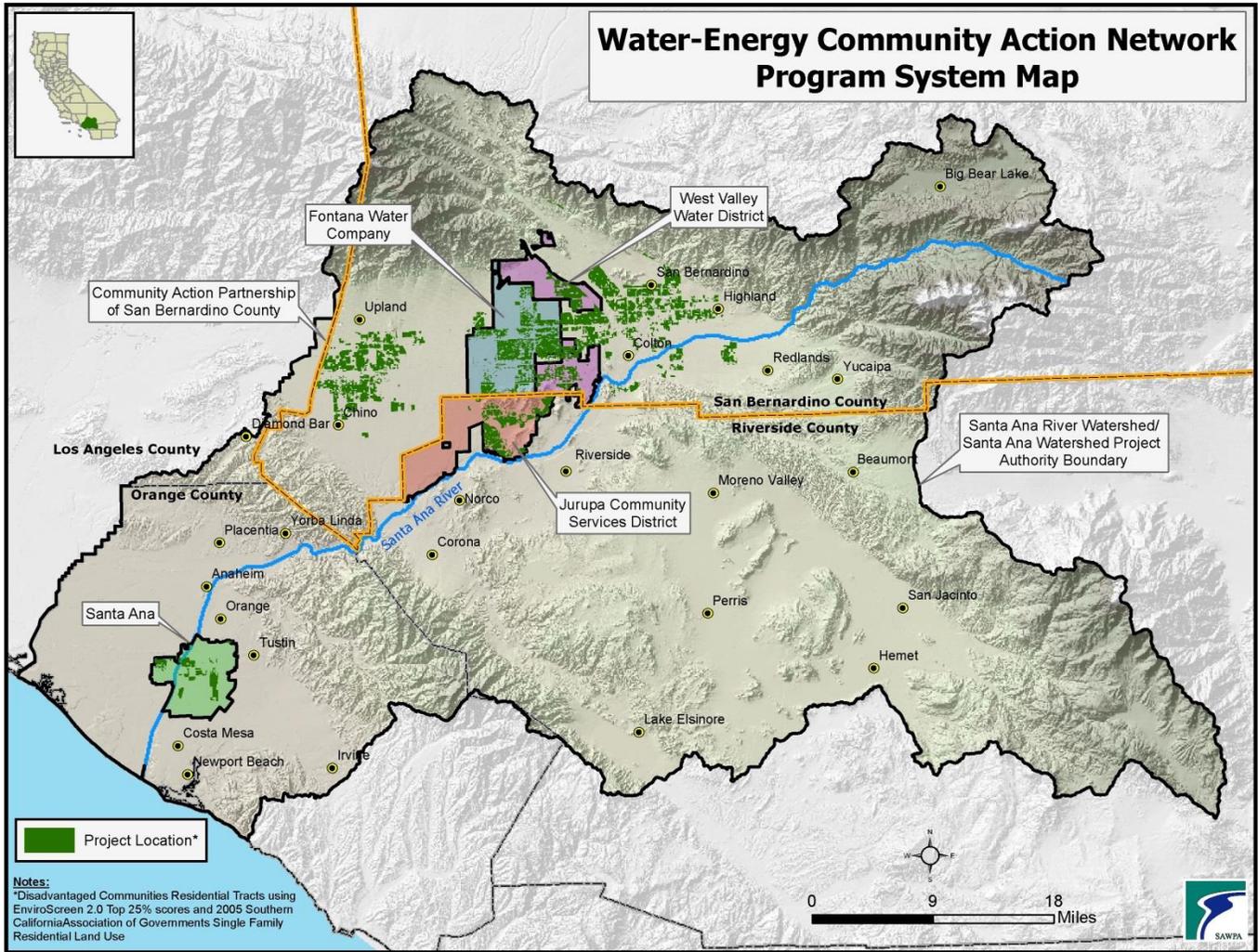
The WE CAN Program will provide an home energy savings retrofit option to DAC residents through the Center for Sustainable Energy and the Community Action Partnership of San Bernardino County contractors. It also will provide a water saving retrofit option (turf removal and replacement with drought tolerant landscaping) through the Santa Ana Watershed Project Authority's partners and contractors.

The measurable and assured benefit to the DACs, the decrease in utility service bills for customers, will be tracked for residents for the water and energy saving retrofits as discussed in Attachment 6 Proposal Monitoring. The Community Action Partnership of San Bernardino County and the retail water agencies which have customers receiving the retrofits, will share aggregated water usage and energy usage data to the state via the project proponent. The savings in dollars for the DAC residents can be calculated by multiplying the utilities (in kWh and hundred cubic feet) used by the residents by the local energy and water retailer's service charges. For the energy saving retrofits in Riverside and Orange Counties, the Center for Sustainable Energy will use the Database for Energy Efficient Resources to calculate deemed energy savings from the energy retrofits.

The benefits to DAC residents also include non-measurable water quality benefits. 280,000 square feet of turf will be removed through the Program, which is typically over-watered and over-fertilized. Excess watering provides runoff that carries pollution to nearby surface waters such as the Santa Ana River, which is used by local residents as a recreational resource. Turf is often laden with fertilizers and pesticides which can negatively impact water quality in downstream water bodies and create algae blooms. Bacterial constituents can be carried through excess runoff, which also negatively downstream impacts.

Per the Senate Bill 535 Interim Guidelines on DACs, the Program will implement outreach efforts that seek to engage and involve DAC members and their representatives. The Program's six outreach field personnel, central program manager and hotline operator, and Orange County Coastkeeper representative will be providing bilingual support to DAC residents who are interested in registering for the water-energy saving retrofits. The three outreach field personnel will be meeting directly with DAC residents to assist them through the paperwork of registering for the Program and answering any questions. The outreach team will also hold workshops and partner with any existing organizations to message the link between water and energy, and the benefits and registration criteria of the Program. Every effort will be made to host events in places where communities normally gather (e.g., schools, community centers) and hold meetings during evenings or other times that are convenient to community members. Signage through doorhangers, social media and lawn signs will provide a consistent message of the water-energy nexus and a referral phone number for the hotline operator who can provide more information to interested DAC residents.

The Program map below identifies the location of the project (in green) which are both the DAC census tracts and the measurable benefit areas. It also shows the non-measurable benefit area of the Santa Ana River. Note that these are the targeted areas of where the outreach personnel will target DAC residents for their enrollment in the water-energy saving retrofits. The Program allows for 1,703 homes to be registered and receive measurable benefits, all of which will be in the project location shown below.



Water Replenishment District Water Savings Calculator

Drought-Resistant Landscaping Water Saving Calculator	Drought-Resistant Landscaping Water Saving Calculator
To estimate how much you might save by changing your landscaping enter your approximate yard area below:	To estimate how much you might save by changing your landscaping enter your approximate yard area below:
<input type="text" value="1000"/> ← Yard Area (Square Feet)	<input type="text" value="1000"/> ← Yard Area (Square Feet)
<input type="text" value="3.75"/> Your water rate (per 100 cubic feet) ?	<input type="text" value="3.75"/> Your water rate (per 100 cubic feet) ?
Type of Landscaping	Type of Landscaping
Grass <input checked="" type="radio"/> Grass <input type="radio"/> Buffalo Grass	Grass <input type="radio"/> Grass <input type="radio"/> Buffalo Grass
Shrubs <input type="radio"/> Regular <input type="radio"/> Water-Wise Landscaping	Shrubs <input type="radio"/> Regular <input checked="" type="radio"/> Water-Wise Landscaping
Estimated monthly water cost <input type="text" value="\$70.125"/>	Estimated monthly water cost <input type="text" value="\$15"/>

Provided at: <http://www.wrd.org/conservation/>



HOME ENERGY SAVER™

HOME ENERGY SAVER REPORT

Prepared by:
Santa Ana Watershed Project Authority



This report is generated by the Home Energy Saver web-based energy audit tool, developed by the U.S. Department of Energy's Lawrence Berkeley National Laboratory, and can be reached at <http://hes.lbl.gov>



HOME ENERGY SAVER™

HOUSE CONFIGURATION

General Information

Name or other identifier this home/session : **WE CAN**; User's email address : iachimore@sawpa.org; Purpose of this assessment : **Hypothetical analysis**; City : **San Bernardino**; State : **California**; City with most similar climate to modeled house : **Riverside**; Year house was built : **1967**; People living in the house, by the age - 0-5 : **4**; People living in the house, by the age - 6-13 : **1**; People living in the house, by the age - 14-64 : **2**; People living in the house, by the age - 65 plus : **0**;

House Shape Size

Energy Prices

Energy Prices - Electricity : **0.152**; Energy Prices - Piped Natural Gas : **0.990**; Energy Prices - Liquid Propane Gas (LPG) : **2.570**; Energy Prices - Fuel Oil : **2.520**;

Building Design

Foundation or floor insulation : **No/Don't Know**; Attic type : **Unconditioned Attic**; Wall Construction Front : **Wall insulation ewwf03wo**; Does the house have weather-stripping and/or caulking : **No**; Describe windows on each side of house - Front Type : **Double-pane, clear, Aluminum**; Describe windows on each side of house - Front SqFt : **72.00**; Describe windows on each side of house - Back Type : **Double-pane, clear, Aluminum**; Describe windows on each side of house - Back SqFt : **72.00**; Describe windows on each side of house - Left Type : **Double-pane, clear, Aluminum**; Describe windows on each side of house - Left SqFt : **36.00**; Describe windows on each side of house - Right Type : **Double-pane, clear, Aluminum**; Describe windows on each side of house - Right SqFt : **36.00**; Stories above ground level : **1**; Roof Insulation level : **R-0**; Type of foundation : **Slab-on-grade Foundation**; Ceiling Insulation level : **R-11 (4-6 inches)**;

Appliances Equipment

Clothes Washer : **Yes**; Number of refrigerators : **1 Refrigerator**; Water heater - year purchased : **See efficiency value**; Water heater - Tank Size : **40**; Water heater - Fuel : **Natural Gas**; Heating equipment - Type : **Central Gas furnace**; Heating equipment - Year purchased : **Do not know / Default**; Cooling equipment - Type : **Central air conditioner**; Cooling equipment - Year Purchased : **Do not know / Default**; Thermal distribution - Duct Location : **Unconditioned attic**; Thermal distribution - Ducts Insulated : **Yes**; Thermal distribution - Boiler pipe insulation : **No/Don't Know**;



HOME ENERGY SAVER™

YEARLY ENERGY COSTS

Providing more details will make your results more accurate.

Existing Home	\$1,569	
With Upgrades	\$1,012	

	<u>Total</u>	<u>Heating</u>	<u>Cooling</u>	<u>Hot Water</u>	<u>Large Appliances</u>	<u>Small Appliances</u>	<u>Lighting</u>
Existing Home	\$1,569	\$433	\$236	\$171	\$313	\$196	\$220
With Upgrades	\$1,012	\$146	\$80	\$149	\$221	\$196	\$220
Savings	\$557	\$287	\$156	\$22	\$92	\$0	\$0

Important Note: These are initial estimates only, and results may vary. If the owner has not already done so, we strongly recommend that they retain a professional energy auditor to develop a detailed work scope and budget for improving the home. We also recommend the Home Performance with ENERGY STAR program when considering home improvements.

[Comparing Results to Home's Utility Bill](#)



HOME ENERGY SAVER™

YEARLY WHOLE HOUSE RESULTS

		Existing Home	With Upgrades	Savings	Percentage Reductions
Whole House	Energy Bill	\$1,569	\$1,012	\$557	36%
	Electricity	6,292 kWh	4,099 kWh	2,193 kWh	35%
	Natural Gas	619 Therms	394 Therms	225 Therms	36%
	Emissions	11,376 CO ₂	7,302 CO ₂	4,074 lb. CO₂	36%
Heating	Energy Bill	\$433	\$146	\$287	66%
	Electricity	413 kWh	132 kWh	281 kWh	68%
	Natural Gas	374 Therms	127 Therms	247 Therms	66%
	Emissions	4,642 lb. CO ₂	1,569 lb. CO ₂	3,073 lb. CO₂	66%
Cooling	Energy Bill	\$236	\$80	\$156	66%
	Electricity	1,551 kWh	528 kWh	1,023 kWh	66%
	Emissions	1,022 lb. CO ₂	348 lb. CO ₂	674 lb. CO₂	66%
Hot Water	Energy Bill	\$171	\$149	\$22	13%
	Natural Gas	173 Therms	151 Therms	22 Therms	13%
	Emissions	2,021 lb. CO ₂	1,764 lb. CO ₂	257 lb. CO₂	13%
Large Appliances	Energy Bill	\$313	\$221	\$92	29%
	Electricity	1,593 kWh	704 kWh	889 kWh	56%
	Natural Gas	72 Therms	116 Therms	-44 Therms	-61%
	Emissions	1,890 lb. CO ₂	1,819 lb. CO ₂	71 lb. CO₂	4%
Small Appliances	Energy Bill	\$196	\$196	\$0	0%
	Electricity	1,290 kWh	1,290 kWh	0 kWh	0%
	Emissions	850 lb. CO ₂	850 lb. CO ₂	0 lb. CO₂	0%
Lighting	Energy Bill	\$220	\$220	\$0	0%
	Electricity	1,445 kWh	1,445 kWh	0 kWh	0%
	Emissions	952 lb. CO ₂	952 lb. CO ₂	0 lb. CO₂	0%

Heating electricity values include fan or pumping energy for homes that have forced-air or water-based heating systems powered by circulation pumps. The values for Hot Water include taps and faucets only; the energy consumed by the water heater to supply hot water for appliances such as clothes washers and dishwashers is included instead in the rows for those appliances.



HOME ENERGY SAVER™

YEARLY HEATING AND COOLING RESULTS

[Show Details](#)

Total Cost	
Cost	\$669
Heating	\$433
Cooling	\$236

Total Energy	
Energy Use	374 therms 1,964 kWh
Heating	374 therms 413 kWh
Cooling	1,551 kWh

Notes: this house is 0% heated by wood fuel.
100% of the floor area is heated and 100% cooled.

Heating electricity values include fan or pumping energy for homes that have forced-air or water-based heating systems powered by circulation pumps.

[What if my results don't match my energy bill?](#)



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YEARLY LARGE APPLIANCES AND WATER HEATING RESULTS

[Show Details](#)

Appliance	Total Cost
First Refrigerator	\$85
Stove	\$33
Oven	\$11
Clothesdryer	\$128
Clotheswasher	\$28
Dishwasher	\$29
Hot Water: Taps and Faucets	\$171
Totals	\$485

Equipment energy is the energy used by motors, heating elements, and burners inside your appliances. This number excludes the energy consumed by your water heater to supply hot water for appliances such as clothes washers and dishwashers (which is included instead in the rows for those appliances).

[What if my results don't match my energy bill?](#)



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YEARLY SMALL APPLIANCES RESULTS

[Show Details](#) ?

Category	Energy Use	Energy Costs
Entertainment	345 kWh	\$52
Home Office	361 kWh	\$55
Miscellaneous Kitchen	464 kWh	\$71
Other Appliances	120 kWh	\$18

[What if my results don't match my energy bill?](#)



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YEARLY LIGHTING RESULTS

Here is the calculated Yearly lighting bill based on the inputs you provided:

[Show Details](#) ?

Room	Energy Use	Energy Costs
All Bathrooms	202 kwh	\$31
All Bedrooms	68 kwh	\$10
Dining Room	120 kwh	\$18
Family Room	77 kwh	\$12
Garage	75 kwh	\$11
Hall	114 kwh	\$17
Kitchen	208 kwh	\$32
Living Room	273 kwh	\$41
Master Bedroom	68 kwh	\$10
Outdoor Lighting	240 kwh	\$36

[What if my results don't match my energy bill?](#)



UPGRADE RECOMMENDATIONS SUMMARY

Visit [Recommendations](#) to see more information on each upgrade.

	<u>Yearly Savings</u>	<u>Estimated Added Cost</u>	<u>How Much is Too Much?</u>	<u>Simple Payback Time</u>	<u>Estimated ROI</u>	<u>Avoided Emissions (lbs. CO₂)</u>
Total for recommended upgrades	\$557	\$12,280	\$5,570	21	-1%	4,074

Important Note: These are initial estimates only, and results may vary. If the owner has not already done so, we strongly recommend that they retain a professional energy auditor to develop a detailed work scope and budget for improving the home. We also recommend the Home Performance with ENERGY STAR program when considering home improvements.

Upgrades Requiring Investment

1. Thermostat
2. Clothes washer
3. Electric clothes dryer
4. Gas water heater
5. Cool roof
6. Duct Sealing
7. Attic insulation
8. Central air conditioner
9. Air sealing
10. Gas furnace
11. Windows
12. Dishwasher
13. Wall insulation
14. Duct Insulation
15. Slab insulation

Other benefits that often come along with these energy-saving upgrades

- Programmable thermostats can help keep your home more comfortable.
- ENERGY STAR® clothes washers can reduce water use significantly, leave the clothes drier thus reducing drying time and energy consumption, and reduce wear and tear on clothes.
- Natural gas clothes dryers reduce your home's peak load on the power grid compared to an electric dryer.
- Efficient gas-fired water heaters may hold their temperature longer following power interruptions and operate more safely.
- Cool reflective roofs reduce solar gains, keeping your home cooler and more comfortable. High temperatures are one of the factors that shorten the lifespan of roofing materials, so cool roofs may last longer than conventional roofs. Cool roofs also help lower the air temperature surrounding your house, which helps fight the urban heat island effect.
- Having a professional seal your home's air leaks can make your home more comfortable, reduce the risk of moisture damage, improve indoor air quality and fire safety, and help to prevent frozen water pipes.
- A well-insulated ceiling can make your home more comfortable and quieter, reduce the risk of moisture damage, enhance fire safety, make your home more disaster-resistant, and help guard against pipe freezing.
- ENERGY STAR® central air conditioners may operate more quietly, be more visually appealing, have better temperature and/or moisture control, and be easier to maintain than minimum efficiency air conditioners.
- Having a professional seal your home's air leaks can make your home more comfortable, reduce the risk of moisture damage, improve indoor air quality and fire safety, and help to prevent frozen water pipes.
- ENERGY STAR® gas-fired furnaces make your home more comfortable. Some models are less prone to causing indoor air quality problems or house fires.
- Energy-efficient windows can make your home more comfortable year-round, reduce condensation, block outside noise, improve fire safety, and cut back on ultraviolet radiation that can fade your carpets and furniture.
- Some ENERGY STAR dishwashers reduce water use and/or have shorter run times.
- Wall insulation can make your home more comfortable and quieter, reduce the risk of moisture damage, enhance fire safety, make your home more disaster-resistant, and help guard against pipe freezing.
- Well-insulated ducts can help avoid rooftop ice-dam formation during the winter
- A well-insulated slab foundation can make your home more comfortable, and guard against moisture problems.



HOME ENERGY SAVER™

UPGRADE RECOMMENDATIONS ?

What efficiency level would you like to model for the initial selection of upgrades? ?

EnergyStar

What simple payback period would you like to use for selecting upgrades?

10

RECALCULATE

Rows that are dimmed are not included in the calculated values for the retrofit package. To include them check their boxes and recalculate.

Add/Remove	Upgrade	Upgrade Choice & Description	Yearly Savings	Estimated Added Cost	How Much is Too Much?	Simple Payback Time	Estimated Return on Investment	Avoided Emissions (lbs. CO₂)
<input type="checkbox"/>	Check/Uncheck All Upgrades	Total for Selected Upgrades:	\$557	\$12,280	\$5,570	21	-1%	4,074
<input checked="" type="checkbox"/>	Thermostat	ENERGY STAR-label	\$174	\$85	\$1,740	0	204%	1,990
<input checked="" type="checkbox"/>	Clothes washer	MEF=1.42 WF=9.5 EN	\$35	\$90	\$350	3	38%	115
<input checked="" type="checkbox"/>	Electric clothes dryer	Switch to gas dryer	\$63	\$340	\$630	5	16%	-46
<input checked="" type="checkbox"/>	Gas water heater	EF=0.62	\$31	\$180	\$310	6	15%	362
<input checked="" type="checkbox"/>	Cool roof	Solar reflectance = 0.5	\$27	\$186	\$270	7	14%	-17
<input checked="" type="checkbox"/>	Duct Sealing	Reduce leakage to 6%	\$90	\$890	\$900	10	6%	780
<input checked="" type="checkbox"/>	Attic insulation	R-38	\$153	\$1665	\$1,530	11	8%	1,279
<input checked="" type="checkbox"/>	Central air conditioner	SEER=14 ENERGY S	\$18	\$218	\$180	12	2%	77
<input checked="" type="checkbox"/>	Air sealing	25% air leakage reduc	\$68	\$850	\$680	13	7%	701
<input checked="" type="checkbox"/>	Gas furnace	AFUE=90 ENERGY S	\$61	\$977	\$610	16	1%	654
<input checked="" type="checkbox"/>	Windows	2-pane/solar-control lo	\$62	\$1296	\$620	21	3%	270
<input checked="" type="checkbox"/>	Dishwasher	EF=0.58 ENERGY ST.	\$11	\$300	\$110	27	NCE	68
<input checked="" type="checkbox"/>	Wall insulation	R-11 wall cavity	\$72	\$2959	\$720	41	NCE	653
<input checked="" type="checkbox"/>	Duct Insulation	R-6	\$19	\$910	\$190	48	NCE	169
<input checked="" type="checkbox"/>	Slab insulation	R-5 slab edge	\$9	\$1334	\$90	148	NCE	238
<input type="checkbox"/>	Indoor lights	CFLs in high-use fixtur	\$77	\$88	\$770	1	84%	618
<input type="checkbox"/>	Refrigerator	15% better than standa	\$11	\$244	\$110	22	2%	48

Important Note: These are initial estimates only, and results may vary. If the owner has not already done so, we strongly recommend that they retain a professional energy auditor to develop a detailed work scope and budget for improving the home. We also recommend the Home Performance with ENERGY STAR program when considering home improvements.

NCE = Not Cost Effective. This upgrade will not pay for itself in your situation. There may be other reasons, such as improved comfort, to implement the upgrade, or it could be made more cost-effective if the investment cost is reduced.

Note: Each of the upgrades in the table above are evaluated in isolation from the others. If the efficiency level is changed for one upgrade, its potential impact on other upgrades will not be counted in the row-by-row estimates. However, these kinds of interactions are included in the "package" totals associated with the whole-house totals and chart at the top of the page, for the upgrades selected as part of the package. For example, if the furnace efficiencies are raised, the energy savings from wall insulation will not change in the row estimate, but the incremental savings from including insulation in the package will be less due to the more efficient furnace's impact on reducing the energy required to make up heat losses through the wall (there is less energy being used, so less to save).



DETAILED UPGRADE RECOMMENDATIONS REPORT

This is a printable report of the upgrades selected for the home. These upgrades have the potential to save \$557 each year on the utility bill.

Upgrade Package Summary:

Estimate Yearly Bill Savings:	\$557 ?
Estimated Lifetime Energy Savings:	\$11,140 ?
Estimated Added Cost:	\$12,280 ?
Maximum Price for 10 Year Payback:	\$257,880 ?
Return on Investment:	-1% ?
Upgrade Pays for Itself in:	21 years ?

You selected the following upgrades:

- [Thermostat: Replace your thermostat with one that you can program.](#)
- [Clothes washer: Replace your washer. Pick a new one with an ENERGY STAR label.](#)
- [Clothes dryer: Replace your dryer. Switch from electric powered to natural gas.](#)
- [Water heater: Replace your water heater. Pick an one that says energy efficient.](#)
- [Roof: Replace your roof with a "cool roof," made of high solar reflectance materials. Be sure that the materials have an ENERGY STAR label.](#)
- [Air tightness: Have a professional seal your ducts to reduce leakage.](#)
- [Attic: Add insulation in the attic floor. Try to get to R-38.](#)
- [Central Air: Replace your central air conditioner. Pick a new one with an ENERGY STAR label.](#)
- [Air tightness: Have a professional seal the cracks and leaks in your home.](#)
- [Furnace: Replace your furnace. Pick a new one with an ENERGY STAR label.](#)
- [Windows: Replace your windows. Pick new ones with a double-pane solar-control low-E argon gas panes and a wood frame.](#)
- [Dishwasher: Replace your dishwasher. Pick a new one with an ENERGY STAR label.](#)
- [Exterior Walls: Add insulation to the exterior walls. Try to get to at least R-11.](#)
- [Ducts: Add insulation around your ducts in unfinished spaces. Try to reach at least R-6.](#)
- [Slab Foundation: Insulate the outer edge of your slab foundation.](#)

Note: The economic benefits for each of the upgrades below are evaluated in isolation from the other upgrades. If the efficiency level is changed for one upgrade, its potential impact on other upgrades will not be counted in the individual upgrade estimates. However, these kinds of interactions are included in the "package" totals associated with the whole-house totals and chart at the top of the page (above). For example, if the furnace efficiency is increased, the energy savings from wall insulation will not change in the table below, but the incremental savings from including insulation in the package will be less due to the more efficient furnace's impact on reducing the energy required to make up heat losses through the wall (there is less energy being used, so less to save).

Thermostat: Replace your thermostat with one that you can program.

Economic Benefits:

Estimate Yearly Bill Savings:	\$174
Estimated Lifetime Energy Savings:	\$3,480
Estimated Added Cost:	\$85
Maximum Price for 10 Year Payback:	\$1,740
Return on Investment:	204%
Upgrade Pays for Itself in:	Under 1 year

Additional Benefits:

Programmable thermostats can help keep your home more comfortable.

Upgrade Description:

Install an ENERGY STAR-labeled programmable thermostat, and program it to change the temperature settings when you are away from home and at night. EPA estimates that ENERGY STAR-labeled programmable thermostats can save consumers 10-15% on heating and cooling bills when used properly. Note: Our calculations bill savings and cost-effectiveness assume that the heating-season set-point is decreased 4 degrees F during the day 9 am to 5 pm and at night 11 am to 7 pm, while the cooling-season set-point is increased 3 degrees F during those same periods. Larger set-point adjustments can provide additional bill savings.

Purchasing Tips:

- Some programmable thermostats have a "smart" feature designed to maximize energy savings. These thermostats continually monitor usage patterns in order to determine the best time to turn the system on in order to reach the desired temperature setting, while minimizing energy use.

More Information:

- [ENERGY STAR thermostat product list](#)
- [General Information](#)

[\[Return to upgrades list\]](#)

Clothes washer: Replace your washer. Pick a new one with an ENERGY STAR label.

Economic Benefits:

Estimate Yearly Bill Savings:	\$35
Estimated Lifetime Energy Savings:	\$700
Estimated Added Cost:	\$90
Maximum Price for 10 Year Payback:	\$350
Return on Investment:	38%
Upgrade Pays for Itself in:	3 years

Additional Benefits:

ENERGY STAR® clothes washers can reduce water use significantly, leave the clothes drier thus reducing drying time and energy consumption, and reduce wear and tear on clothes.

Upgrade Description:

When replacing your clothes washer, choose an ENERGY STAR-labeled model. ENERGY STAR clothes washers can reduce energy consumption by up to 70% and are available in top-loading and front-loading designs. Some ENERGY STAR models use up to 50% less water in addition to saving energy.

Note: Our calculations bill savings, typical upgrade costs, and cost-effectiveness are for a model with the lowest efficiency that qualifies for the ENERGY STAR label.

Purchasing Tips:

- Choose a clothes washer with high-speed spin cycles. This feature removes more water from clothes, which reduces the energy and time required for drying.
- Select a low water-use, high efficiency washer. Front-loading tumble-action washers can cut energy use by up to 70 percent, reduce water consumption significantly, and may actually get clothes cleaner. ¹
- Look for pre-soaking and/or "suds saver" options which conserve energy.
- Clothes washers come with [EnergyGuide](#) yellow and black labels. Use these labels to select the most efficient model for the capacity you have chosen.

More Information:

- [ENERGY STAR clothes washer product list](#)
- [General Information from DOE](#)
- [Top-Rated Energy-Efficient Clothes Washers from ACEEE](#)

[\[Return to upgrades list\]](#)

Clothes dryer: Replace your dryer. Switch from electric powered to natural gas

Economic Benefits:

Estimate Yearly Bill Savings:	\$63
Estimated Lifetime Energy Savings:	\$1,260
Estimated Added Cost:	\$340
Maximum Price for 10 Year Payback:	\$630
Return on Investment:	16%
Upgrade Pays for Itself in:	5 years

Additional Benefits:

Natural gas clothes dryers reduce your home's peak load on the power grid compared to an electric dryer.

Upgrade Description:

When replacing your electric clothes dryer, select a natural gas model. In many situations, this will reduce your overall energy bill because natural gas tends to cost less than electricity, for the same heating value.

Note: Our calculations bill savings, typical upgrade costs, and cost-effectiveness are for a minimum-efficiency natural gas dryer model. The default upgrade cost provided here assumes that a natural gas connection is available at your clothes dryer. If this is not the case, be sure to include the cost of extending

Purchasing Tips:

- To use a gas dryer, your laundry room must have a gas hookup, with proper connections and safe venting of the gas's exhaust, in addition to an electrical outlet
- Look for a dryer with a moisture sensor, and use the dryness settings rather than timed drying.
- When replacing your clothes washer, choose a model with high-speed spin cycles. This feature removes more water from clothes, which reduces the energy and time required for drying.

More Information:

- [General Information from DOE](#)
- [Laundry tips from ACEEE](#)
- [Information from the California Energy Commission](#)

[\[Return to upgrades list\]](#)

Water heater: Replace your water heater. Pick an one that says energy efficient.

Economic Benefits:

Estimate Yearly Bill Savings:	\$31
Estimated Lifetime Energy Savings:	\$620
Estimated Added Cost:	\$180
Maximum Price for 10 Year Payback:	\$310
Return on Investment:	15%
Upgrade Pays for Itself in:	6 years

Additional Benefits:

Efficient gas-fired water heaters may hold their temperature longer following power interruptions and operate more safely.

Upgrade Description:

When replacing your gas water heater, choose an energy-efficient model with an Energy Factor of 0.62 or higher.

Note: Our calculations bill savings, typical upgrade costs, and cost-effectiveness assume the efficient water heater has an energy factor of 0.62 and recovery efficiency of 0.76. Higher efficiency units are available, and would provide additional energy savings.

Purchasing Tips:

- The most important measure of efficiency for water heaters is the Energy Factor EF. The higher the EF, the more efficient the water heater.
- Purchase a water heater whose tank is internally insulated with at least R-16. ⁵
- A water heater that is too large for your home not only has a higher purchase cost but will increase your energy costs due to excessive cycling and standby losses. The resources below provide good, simple guidance on proper sizing of water heaters. The size, or "capacity", of a fuel-fired water heater should be judged by its first hour rating FHR, not its tank size. Due to larger burners, some gas water heaters with smaller tanks actually have higher capacities FHRs than models with larger tanks.
- Many types of water heaters are now available, such as "demand" tankless, "indirect" or "integrated", and solar-assisted water heaters. [More Information](#)
- New and/or efficient gas water heaters may have different venting and flue requirements. When replacing your water heater make sure your contractor assesses your existing flue, follows new code requirements for venting water heaters, and obtains necessary permits and inspections. ³

More Information:

- [General Information from DOE](#)
- [DOE Water Heating fact sheet](#)
- [Top-Rated Energy-Efficient Water Heaters from ACEEE](#)
- [GAMA consumer's directory click on "Consumers"](#)
- [How to prevent health and safety problems with combustion equipment](#)

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Roof: Replace your roof with a "cool roof," made of high solar reflectance materials. Be sure that the materials have

Economic Benefits:

Estimate Yearly Bill Savings:	\$27
Estimated Lifetime Energy Savings:	\$540
Estimated Added Cost:	\$186
Maximum Price for 10 Year Payback:	\$270
Return on Investment:	14%
Upgrade Pays for Itself in:	7 years

Additional Benefits:

Cool reflective roofs reduce solar gains, keeping your home cooler and more comfortable. High temperatures are one of the factors that shorten the lifespan of roofing materials, so cool roofs may last longer than conventional roofs. Cool roofs also help lower the air temperature surrounding your house, which helps fight the urban heat island effect.

Upgrade Description:

When replacing your roof, choose a "cool" roofing material that qualifies for the ENERGY STAR label. These roofing materials reflect more of the sun's energy, staying cooler than typical materials and reducing your air conditioning bill. Our calculations bill savings, typical upgrade costs, and cost-effectiveness are for a low-slope roofing material with the minimum reflectance levels that qualify for the ENERGY STAR label 0.60 reflectance after some weathering. To qualify for the ENERGY STAR label, steep-slope roofs must have an initial solar reflectance of greater than 0.25.

Purchasing Tips:

- The ENERGY STAR criteria differ for low-slope less than 2:12 inches and high-slope roofs. The reflectance requirements are lower for high-slope roofs because in the past it has been difficult to make shingles and tiles highly reflective these materials are typically used for a high-slope roofs. High-reflectance products for high-slope roofs are now becoming more common in the market, so look for the highest reflectance materials you can for your roof type.

More Information:

- [target="footnote"HRFF="http://www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products">ENERGY STAR qualifying roofing product list](http://www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products)
- [Cool Roof Rating Council](#)
- [California Energy Commission](#)
- [Background about urban heat islands](#)

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Air tightness: Have a professional seal your ducts to reduce leakage

Economic Benefits:

Estimate Yearly Bill Savings:	\$90
Estimated Lifetime Energy Savings:	\$1,800
Estimated Added Cost:	\$890
Maximum Price for 10 Year Payback:	\$900
Return on Investment:	6%
Upgrade Pays for Itself in:	10 years

Additional Benefits:

Having a professional seal your home's air leaks can make your home more comfortable, reduce the risk of moisture damage, improve indoor air quality and fire safety, and help to prevent frozen water pipes.

Upgrade Description:

Have a qualified professional seal your home's air leaks. Leaky houses waste energy because heated or cooled air can easily escape. Older homes tend to be leakier than newer homes. Tightening up a leaky house will reduce the heating and cooling bills. Recent advancements in air sealing technology allow specialists to go beyond the old techniques of caulking and weatherstripping around obvious places such as doors and windows. The biggest problems are usually hidden leaks in out of the way places such as attics, floors and walls, which are easily found and sealed by a specialist. Note: The annual bill savings and cost-effectiveness assume that your home's air leakage is reduced by 25%.

Purchasing Tips:

- To get the best results, hire a qualified contractor, preferably a "building performance contractor", or "energy auditor" to find out where the leaks are in your home's shell. Make sure the contractor uses a "blower door" test to find the air leaks. An infrared scan can be beneficial in addition to the blower door test. Check with your utility company; some offer no- or low-cost basic energy audits. However, the extra money you would spend to have the audit done by a home performance contractor is often well worth it. [5.6](#)
- Make sure your contractor tests the leakage rate after completing the sealing, not only to determine the degree of improvement, but also to ensure that the ventilation in your home is adequate. If you don't already have proper mechanical ventilation, consider

installing a ventilation system. Proper home ventilation will make your home healthier and more comfortable.

- Make sure your contractor performs a combustion safety test after sealing your home's air leaks. This test checks for backdrafting and carbon monoxide, and will help assure your home is safe. ⁹
- If you choose to do the work yourself, follow the guidance in ENERGY STAR's [Do-It-Yourself Guide to ENERGY STAR Homesealing](#).

More Information:

- [ENERGY STAR air sealing including DIY guide to air sealing](#)
- [Common Air Leakage Sites in the Home](#)
- [Information about Air Leakage Testing](#)
- [Does your home have enough ventilation?](#)

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Attic: Add insulation in the attic floor. Try to get to R-38.

Economic Benefits:

Estimate Yearly Bill Savings:	\$153
Estimated Lifetime Energy Savings:	\$3,060
Estimated Added Cost:	\$1,665
Maximum Price for 10 Year Payback:	\$1,530
Return on Investment:	8%
Upgrade Pays for Itself in:	11 years

Additional Benefits:

A well-insulated ceiling can make your home more comfortable and quieter, reduce the risk of moisture damage, enhance fire safety, make your home more disaster-resistant, and help guard against pipe freezing.

Upgrade Description:

Insulate your ceiling to at least R-38. In a typical home, half or more of the energy loss is through the exterior walls, floor and roof. Proper insulation, as well as sealing air leaks in your home's shell, is vital to reducing these energy losses.

Note: Our calculations bill savings, typical upgrade costs, and cost-effectiveness assume the ceiling insulation is increased to R-38. Insulating to a higher R-value would provide additional energy savings.

Purchasing Tips:

- Make sure all holes in the attic floor are sealed before you install insulation. Make sure there is a vapor retarder between the attic floor and the insulation to help prevent excess moisture from condensing on the insulation. However, if you are adding insulation on top of pre-existing insulation, don't install a vapor retarder, since it may trap moisture in the old insulation underneath. ⁵
- If access to the attic is limited, blown-in cellulose or fiberglass insulation is your best bet. ⁵
- Make sure the insulation does not block the attic vents, and that it is even and free of gaps. ⁵
- When comparing contractors' bids, make sure they are for the same insulating value R-value, not just the same number of inches. ⁷
- If you are doing the installation yourself, consider using cellulose. Cellulose insulation is less expensive and has a higher R-value per inch than fiberglass, and will not irritate your skin and lungs. ⁷

More Information:

- [General Information](#)
- [DOE Insulation Tips](#)
- [Installation Tips](#)
- [Tips for determining the R-value of old insulation](#)

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Central Air: Replace your central air conditioner. Pick a new one with an ENERGY STAR label

Economic Benefits:

Estimate Yearly Bill Savings:	\$18
Estimated Lifetime Energy Savings:	\$360
Estimated Added Cost:	\$218
Maximum Price for 10 Year Payback:	\$180
Return on Investment:	2%

Upgrade Pays for Itself in:

12 years

Additional Benefits:

ENERGY STAR® central air conditioners may operate more quietly, be more visually appealing, have better temperature and/or moisture control, and be easier to maintain than minimum efficiency air conditioners.

Upgrade Description:

When replacing your central air conditioner, choose an ENERGY STAR-labeled model. These units can save 20% or more of your cooling bill.

Note: Our calculations bill savings, typical upgrade costs, and cost-effectiveness are for a model with the lowest efficiency that qualifies for the ENERGY STAR label 14 SEER. Higher efficiency models are available, which would provide additional bill savings.

Purchasing Tips:

- All new central air conditioners are labeled with a Seasonal Energy Efficiency Ratio SEER rating. Use the SEER to compare different models. The higher the SEER, the more efficient the unit.
- For maximum efficiency, ask your contractor to make sure the efficiency ratings for the indoor and outdoor coils match. Have the contractor install removable airtight access panels in the indoor unit so a service technician can clean the cooling coil easily.⁴
- Don't buy an oversized unit. A unit that's too big for your needs will waste energy, have less ability to control humidity, and have a shorter life due to excessive on-off cycling. Ask your contractor for an exact heat-gain calculation following ACCA Manual J procedures to determine the proper size unit for your house. Make sure the contractor sizes the unit based on the latent cooling load as well as the sensible cooling load. Do not rely on rule-of-thumb estimates as they tend to be inaccurate. If you've improved your home's efficiency since the last time you purchased an air conditioner, you may be able to purchase a smaller unit.^{4,5}
- Consider buying a two-speed air conditioner, which can run very efficiently at its lower speed during most of the cooling season, while using its higher speed to provide all the cooling you need on the hottest days.
- Locate the outside unit properly. Install it in a cool, shaded spot about two feet from the north or east side of your home. Avoid direct sunlight, which makes the unit work harder, and keep the unit away from other objects. Don't enclose the unit with a deck or shrubbery - it needs room to breathe.⁴
- If your duct system has leaks or disconnected portions, you will not reap the full energy savings you could get from a high efficiency air conditioner. Consider having your contractor check the entire length of your ductwork for leaks and seal any leaks with mastic-type sealant, not duct tape. It's now possible for a contractor to perform verified duct sealing by using a special fan to test duct system leakage before and after sealing. Also have the contractor check for and repair disconnected ducts - a common problem. Insulate any ducts in unheated spaces with R-6 or higher insulation.
- If you don't already have one, consider purchasing a programmable thermostat and having your contractor install it along with your new air conditioner.

More Information:

- [ENERGY STAR central A/C product list](#)
- [Top-Rated Energy-Efficient Central A/C from ACEEE](#)
- [General Information from DOE](#)
- [Sizing Heating and Cooling Equipment](#)

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Air tightness: Have a professional seal the cracks and leaks in your home.

Economic Benefits:

Estimate Yearly Bill Savings:	\$68
Estimated Lifetime Energy Savings:	\$1,360
Estimated Added Cost:	\$850
Maximum Price for 10 Year Payback:	\$680
Return on Investment:	7%
Upgrade Pays for Itself in:	13 years

Additional Benefits:

Having a professional seal your home's air leaks can make your home more comfortable, reduce the risk of moisture damage, improve indoor air quality and fire safety, and help to prevent frozen water pipes.

Upgrade Description:

Have a qualified professional seal your home's air leaks. Leaky houses waste energy because heated or cooled air can easily escape. Older homes tend to be leakier than newer homes. Tightening up a leaky house will reduce the heating and cooling bills.

Recent advancements in air sealing technology allow specialists to go beyond the old techniques of caulking and weatherstripping around obvious places such as doors and windows. The biggest problems are usually hidden leaks in out of the way places such as attics, floors and walls, which are easily found and sealed by a specialist.

Note: The annual bill savings and cost-effectiveness assume that your home's air leakage is reduced by 25%.

Purchasing Tips:

- To get the best results, hire a qualified contractor, preferably a "building performance contractor", or "energy auditor" to find out where

the leaks are in your home's shell. Make sure the contractor uses a "blower door" test to find the air leaks. An infrared scan can be beneficial in addition to the blower door test. Check with your utility company; some offer no- or low-cost basic energy audits.

However, the extra money you would spend to have the audit done by a home performance contractor is often well worth it. [5.6](#)

- Make sure your contractor tests the leakage rate after completing the sealing, not only to determine the degree of improvement, but also to ensure that the ventilation in your home is adequate. If you don't already have proper mechanical ventilation, consider installing a ventilation system. Proper home ventilation will make your home healthier and more comfortable.
- Make sure your contractor performs a combustion safety test after sealing your home's air leaks. This test checks for backdrafting and carbon monoxide, and will help assure the safety of your home's occupants. [9](#)
- If you choose to do the work yourself, follow the guidance in ENERGY STAR's [Do-It-Yourself Guide to ENERGY STAR Homesealing](#).

More Information:

- [ENERGY STAR air sealing including DIY guide to air sealing](#)
- [Common Air Leakage Sites in the Home](#)
- [Information about Air Leakage Testing](#)
- [Does your home have enough ventilation?](#)

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Furnace: Replace your furnace, Pick a new one with an ENERGY STAR label.

Economic Benefits:

Estimate Yearly Bill Savings:	\$61
Estimated Lifetime Energy Savings:	\$1,220
Estimated Added Cost:	\$977
Maximum Price for 10 Year Payback:	\$610
Return on Investment:	1%
Upgrade Pays for Itself in:	16 years

Additional Benefits:

ENERGY STAR® gas-fired furnaces make your home more comfortable. Some models are less prone to causing indoor air quality problems or house fires.

Upgrade Description:

When replacing your gas furnace, choose an ENERGY STAR-labeled model. These units can save 15% or more of your heating bill.

Note: Our calculations bill savings, typical upgrade costs, and cost-effectiveness are for a furnace with the lowest efficiency that qualifies for the ENERGY STAR label 90 AFUE. Higher efficiency models are available, which can provide additional bill savings.

Purchasing Tips:

- Buy the right size of furnace for your needs. If you have upgraded your home's insulation or windows since your last furnace was installed, you may be able to down-size your furnace i.e., buy a smaller-capacity furnace which can reduce the cost. If you buy a furnace that is too big for your home's needs, it will have short cycle times and reduced efficiency as a result. A furnace that is properly sized costs less to operate. Be sure to have your contractor perform a heat-loss, heat-gain calculation, and do not rely on rule-of-thumb sizing estimates, which are often inaccurate. [3](#)
- If you live in a large house, consider purchasing one of the higher efficiency furnaces that come with two-stage burners. These burners allow the furnace to operate at lower burn rates using less fuel when the home's heating demand is low. When the heating demand is higher, the second stage burner is employed. The additional savings from this feature may well be worth the cost if you live in a large home. [3](#)
- New and/or efficient furnaces often have different venting and flue requirements. When replacing your furnace make sure your contractor assesses your existing flue, follows new code requirements for venting furnaces, and obtains necessary permits and inspections. [3](#)
- All new furnaces are labeled with their Annual Fuel Utilization Efficiency AFUE. The higher the AFUE, the more efficient the unit.
- Consider selecting a furnace with an electronically commutated, or ECM, blower motor. ECM motors are considerably more efficient than standard motors. Consider this feature especially if you run your furnace fan all year long for such things as comfort or air cleaning. A furnace fan with an ECM motor could cut the cost of running the furnace fan by a factor of 5. [3](#)
- If your duct system has leaks or disconnected portions, you will not reap the full energy savings you could get from a high efficiency furnace. Consider having your heating contractor check the entire length of your ductwork for leaks and seal any leaks with mastic-type sealant, not duct tape. It's now possible for a contractor to perform verified duct sealing by using a special fan to test duct system leakage before and after sealing. Also have the contractor check for and repair disconnected ducts - a common problem. Insulate any ducts in unheated spaces to at least R-6.
- If you don't already have one, consider purchasing a programmable thermostat and having your contractor install it along with your new furnace.

More Information:

- [ENERGY STAR furnace product list](#)
- [Consortium for Energy Efficiency furnace product list](#)
- [Top-Rated Energy-Efficient Furnaces from ACEEE](#)

- [General Information from DOE click on "Space Heating and Cooling"](#)
- [Sizing and Installation of Heating and Cooling Equipment](#)
- [How to prevent health and safety problems with combustion equipment](#)

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Windows: Replace your windows. Pick new ones with adouble-pane solar-control low-E argon gas panes and a wood frame

Economic Benefits:

Estimate Yearly Bill Savings:	\$62
Estimated Lifetime Energy Savings:	\$1,240
Estimated Added Cost:	\$1,296
Maximum Price for 10 Year Payback:	\$620
Return on Investment:	3%
Upgrade Pays for Itself in:	21 years

Additional Benefits:

Energy-efficient windows can make your home more comfortable year-round, reduce condensation, block outside noise, improve fire safety, and cut back on ultraviolet radiation that can fade your carpets and furniture.

Upgrade Description:

When replacing windows, choose a double-pane, solar-control low-E, argon gas-filled, wood or vinyl frame window.

Note: The annual bill savings and cost-effectiveness assume that you replace all of your windows with windows that have U-factor=0.36 and SHGC=0.31 see the links in More Information for an explanation of these units. Bill savings will be less if you do not replace all of your windows, but the cost-effectiveness of replacing less than all of your windows should be approximately the same as shown above. Windows with even better performance are available, and could provide additional energy savings.

Purchasing Tips:

- Choose a window that is appropriate for your climate. ENERGY STAR window labels have a Climate Region Map that indicates which of four broad climate regions Northern, North/Central, South/Central, or Southern the window qualifies for. Make sure the window you choose is appropriate for the region you live in.
- Consider different types of glazing for windows on different sides of your house to benefit from passive solar energy and maximize energy benefits. Install the lowest U-value windows you can afford on north-facing windows. Select windows with appropriate low-e coatings for your location on the east, west, and south sides of your house. ⁶
- To maximize energy performance, choose windows with larger unbroken glazing areas instead of multi-pane or true-divided-light windows. Applied grills that simulate true- divided-light windows, however, do not reduce energy efficiency. ⁶
- Choose windows with good warranties against the loss of the air seal. If the glazing seal is lost, not only will fogging occur, but also any low-conductivity gas between the layers of glass will immediately be lost. ⁶
- If summer heat gain is a problem in your house, look for windows with low-e coatings, especially spectrally selective low-e coatings, which significantly reduce solar heat gain and improve insulation without affecting visible light or color. Tinted windows also reduce solar heat gain, but they transmit less visible light.
- Look for the National Fenestration Rating Council NFRC label to help you compare performance and other features. "
- Select windows with low air leakage ratings - between 0.01 and 0.06 cfm/ft. ⁶

More Information:

- [ENERGY STAR Windows](#)
- [Tips about efficient windows from DOE](#)
- [General Information from the Efficient Windows Collaborative](#)
- [ACEEE Consumer Guide to Windows](#)
- [California Energy Commission](#)

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Dishwasher: Replace your dishwasher. Pick a new one with an ENERGY STAR label.

Economic Benefits:

Estimate Yearly Bill Savings:	\$11
Estimated Lifetime Energy Savings:	\$220
Estimated Added Cost:	\$300
Maximum Price for 10 Year Payback:	\$110
Return on Investment:	-7%

Upgrade Pays for Itself in:

27 years

Additional Benefits:

Some ENERGY STAR dishwashers reduce water use and/or have shorter run times.

Upgrade Description:

When replacing your dishwasher, choose an ENERGY STAR- labeled model. ENERGY STAR dishwashers must be at least 15% more efficient than federal efficiency standards. Models are available that are over twice as efficient as a standard new dishwasher. Many ENERGY STAR models reduce water consumption in addition to saving energy. Note: Our calculations bill savings, typical upgrade costs, and cost-effectiveness are for a model with the lowest efficiency that qualifies for the ENERGY STAR label.

Purchasing Tips:

- Choose a dishwasher that allows you the option of air drying rather than heat drying. Air drying uses much less energy than heat drying. ¹
- Look for models with internal "booster heaters" which permit lower water heater temperature settings.
- Choose a dishwasher that provides several wash cycle options, such as "energy-saving" or "short wash" cycles. These features reduce energy and water consumption.
- Select a dishwasher with the appropriate capacity for your needs. Dishwashers are classified as either compact or standard capacity. Compact models use less energy but also hold fewer dishes. If you have to run the compact dishwasher more often, you could actually use more energy than with a standard capacity dishwasher. ¹
- Dishwashers come with [EnergyGuide](#) yellow and black labels. Use these labels to select the most efficient model for the capacity you have chosen.

More Information:

- [ENERGY STAR dishwasher product list](#)
- [Top-Rated Energy-Efficient Dishwashers from ACEEE](#)
- [Tips for Lowering Your Dishwasher Energy Usage from DOE](#)

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Exterior Walls: Add insulation to the exterior walls. Try to get to at least R-11.

Economic Benefits:

Estimate Yearly Bill Savings:	\$72
Estimated Lifetime Energy Savings:	\$1,440
Estimated Added Cost:	\$2,959
Maximum Price for 10 Year Payback:	\$720
Return on Investment:	0%
Upgrade Pays for Itself in:	41 years

Additional Benefits:

Wall insulation can make your home more comfortable and quieter, reduce the risk of moisture damage, enhance fire safety, make your home more disaster-resistant, and help guard against pipe freezing.

Upgrade Description:

Insulate exterior walls to at least R-11. In a typical home, half or more of the energy loss is through the exterior walls, floor and roof. Proper insulation, as well as sealing air leaks in your home's shell, is vital to reducing these energy losses. Exterior walls can be the most important part of your shell to insulate, because of their large area.

Note: The annual bill savings and cost-effectiveness assume that you upgrade all of your exterior walls to R-11. The bill savings will be less if you do not upgrade the entire wall area, but the cost-effectiveness of upgrading less than all of your wall area should be approximately the same as shown above.

Purchasing Tips:

- You may be able to tell if your walls are insulated by removing an outlet cover on an exterior wall and looking into the wall cavity. Or, choose a closet or cabinet along an exterior wall. Drill two 1/4" holes into the wall about 4" apart, with one hole above the other; any insulation should be apparent. If you don't see any insulation inside the wall cavity, hire an insulation contractor to blow cellulose or fiberglass insulation into the exterior walls. Blown-in insulation does not require the walls to be torn open. ⁶
- When comparing contractors' bids, make sure they are for the same insulating value R-value, not just the same number of inches. ⁷
- Be sure to check the contractor's work. For blown-in insulation, make sure the contractors install the correct number of bags of insulation for your wall area, as listed on the bags. ⁷

More Information:

- [General Information](#)
- [DOE Insulation Tips](#)
- [Installation Tips](#)
- [Tips for determining the R-value of old insulation](#)

Ducts: Add insulation around your ducts in unfinished spaces. Try to reach at least R-6.

Economic Benefits:

Estimate Yearly Bill Savings:	\$19
Estimated Lifetime Energy Savings:	\$380
Estimated Added Cost:	\$910
Maximum Price for 10 Year Payback:	\$190
Return on Investment:	-8%
Upgrade Pays for Itself in:	48 years

Additional Benefits:

Well-insulated ducts can help avoid rooftop ice-dam formation during the winter

Upgrade Description:

Insulate all exposed ducts in unconditioned spaces to R-6, unless those ducts are already insulated to at least R-4. The average forced-air duct system loses about 30% of the energy produced by the furnace or air conditioner in the course of distributing air to the rooms. This energy loss can be reduced by sealing duct joints with mastic or high-quality duct tape, and insulating ducts in unconditioned spaces. Note: The annual bill savings and cost-effectiveness assume that you insulate your ducts to R-6.

Purchasing Tips:

When *replacing* your duct insulation, choose R-8 or follow your state or local code.

- Be sure a well-sealed vapor barrier exists on the outside of the insulation on cooling ducts to prevent moisture buildup. [8](#)
- Remember that insulating ducts in the basement will make the basement colder. If both the ducts and the basement walls are uninsulated, consider insulating both. [8](#)

More Information:

- [General Information from DOE](#)
- [EPA's brochure "Should You Have the Air Ducts in Your Home Cleaned?"](#)
- [An Introduction to Residential \[Duct\] Systems](#)

Slab Foundation: Insulate the outer edge of your slab foundation.

Economic Benefits:

Estimate Yearly Bill Savings:	\$9
Estimated Lifetime Energy Savings:	\$180
Estimated Added Cost:	\$1,334
Maximum Price for 10 Year Payback:	\$90
Return on Investment:	0%
Upgrade Pays for Itself in:	148 years

Additional Benefits:

A well-insulated slab foundation can make your home more comfortable, and guard against moisture problems.

Upgrade Description:

Apply R-5 rigid foam insulation to the exterior edge of your slab foundation. In a typical home, half or more of the energy loss is through the exterior walls, floor and roof. Proper insulation, as well as sealing air leaks in your home's shell, is vital to reducing these energy losses.

Note: The annual bill savings and cost-effectiveness assume that you apply the R-5 foam insulation to the entire slab-edge area to a depth of two feet. The bill savings will be less if you do not upgrade the entire area, but the cost-effectiveness of upgrading less than all of the crawlspace wall area should be approximately the same as shown above. The default upgrade cost does not include the cost of excavating the foundation the excavation is assumed to occur for other reasons, such as installing drainage or landscaping.

Purchasing Tips:

- When comparing contractors' bids, make sure they are for the same insulating value R-value to the same foundation depth. [7](#)
- Address any exterior drainage problems as part of the insulation project. [5](#)

More Information:

- [General Information](#)
- [DOE Insulation Tips](#)
- [Installation Tips](#)
- [Tips for determining the R-value of old insulation](#)

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