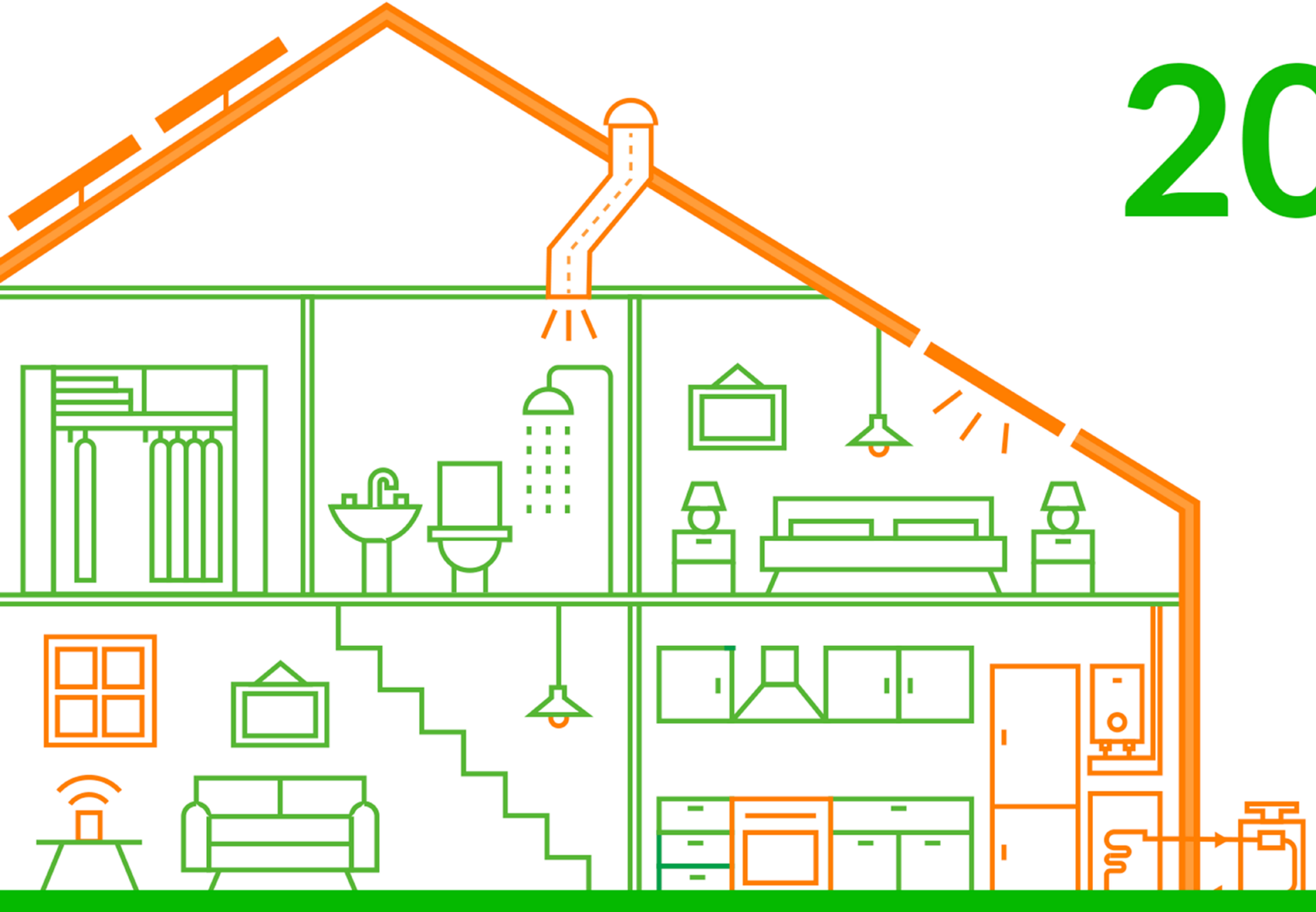
Energy-Efficient Home Design Trends

REPORT

2019



FIXr

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Introduction

Each year, Fixr polls experts in the home design industry to discover what the upcoming trends in home design and building will be. In addition to bringing you a comprehensive look at what single-home buyers are looking for, we also took a closer look at energy savings as well.

Homes and residential buildings **consume the most energy** of any sector, including industrial and transportation. This means that energy-efficiency is key for homeowners looking to save. We polled industry experts on what they believe are the top ways that homeowners will utilize design trends and new innovations to help lower their energy bills in coming years.

Key findings include:

When it comes to homes being purchased and built in 2019, there are trending key points, including:

- The majority of homeowners are personally motivated to save energy in order to also save money.
- Homeowners have a significant environmental awareness, which is driving some decisions.
- Ducts and windows are the two most effective places to save through air sealing.
- Heat pumps are the most popular method to heat an energy-efficient house.
- Tankless heaters are the most efficient way to heat water.
- Solar power remains the most common way to utilize renewable energy in the home.
- Cellulose and fiberglass are tied as the most popular ways to insulate an attic.

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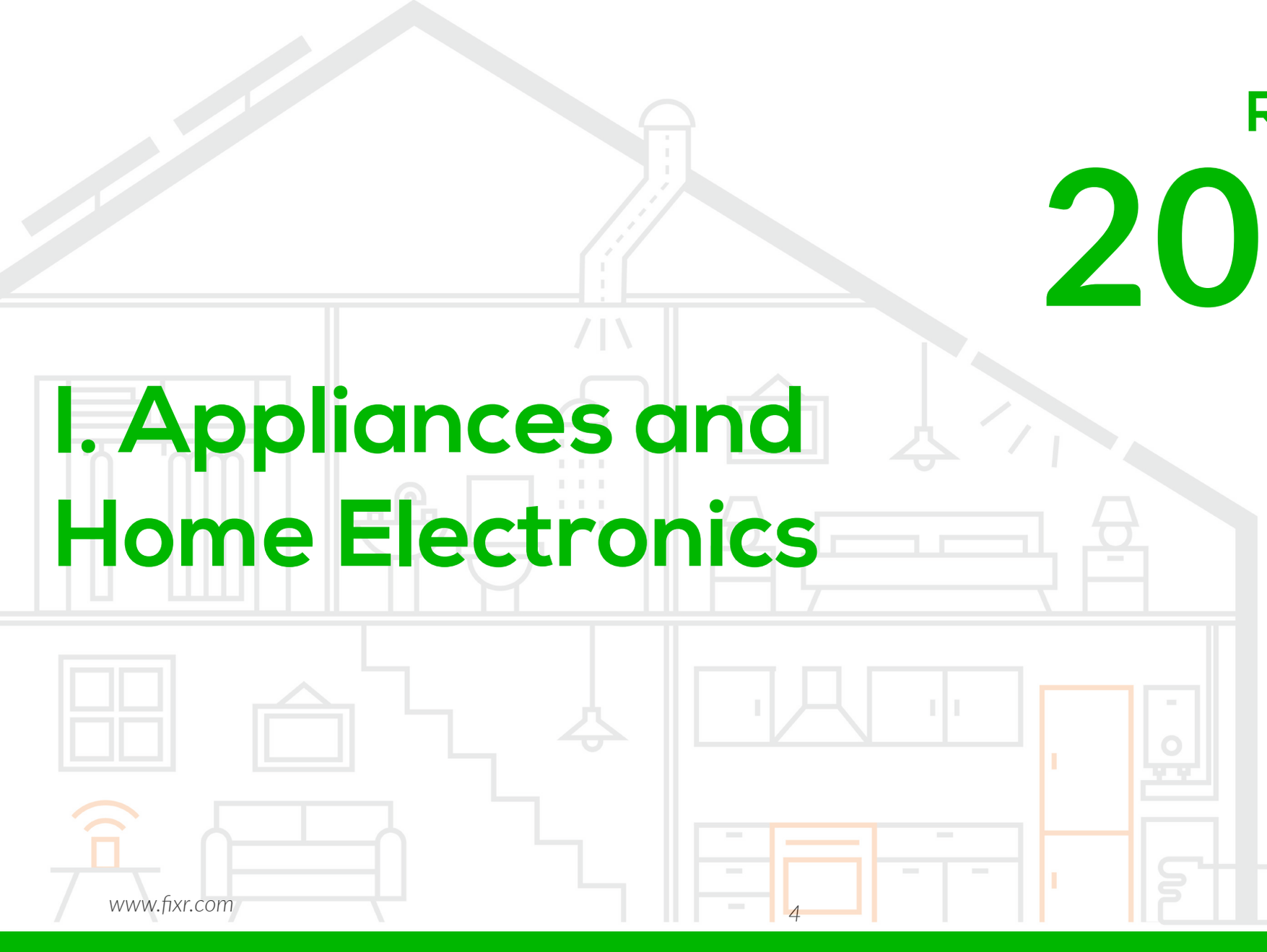
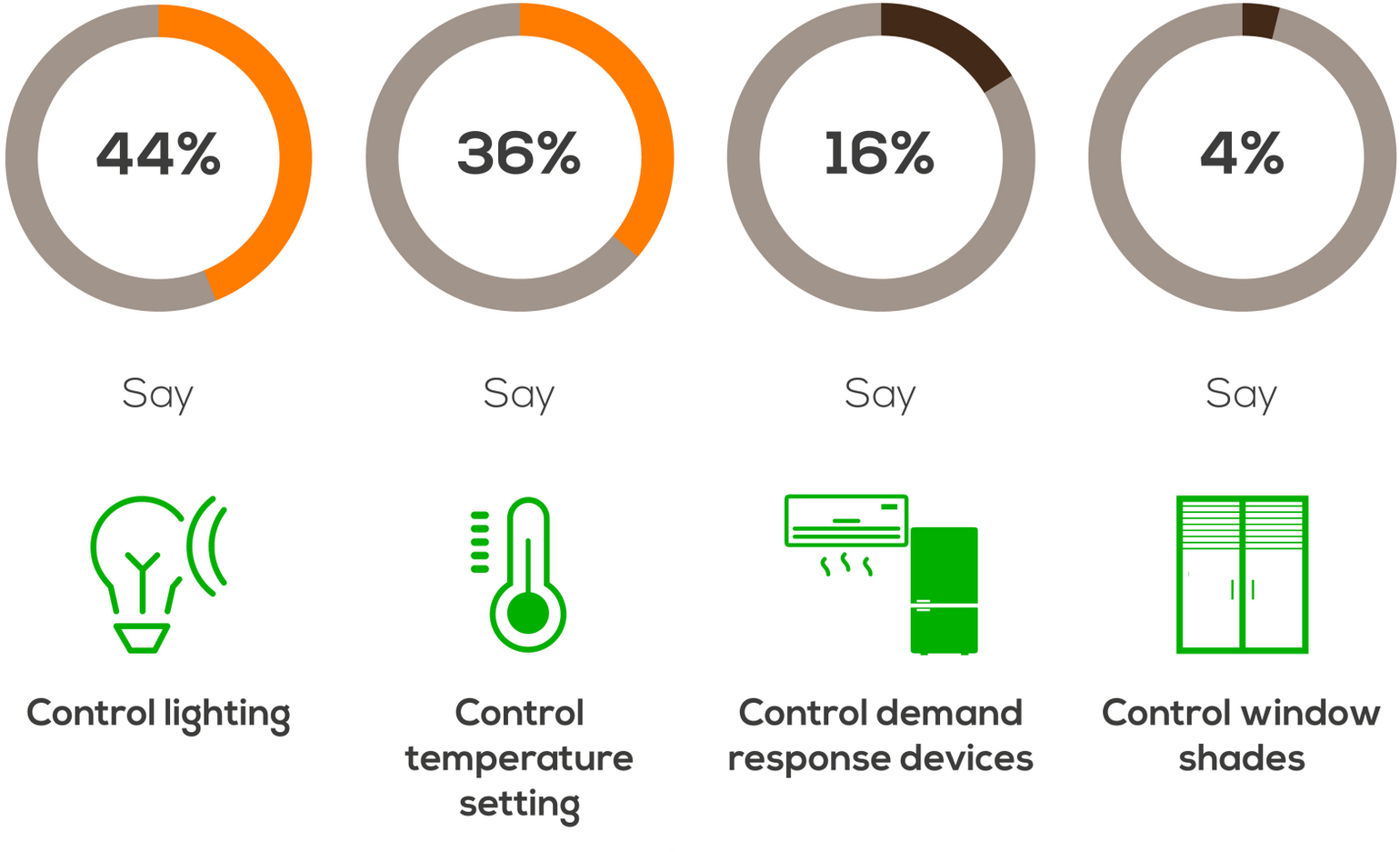
I. Appliances and Home Electronics



I. Appliances and Home Electronics

1. 1. Which way can smart home devices be utilized to most improve energy-efficiency?

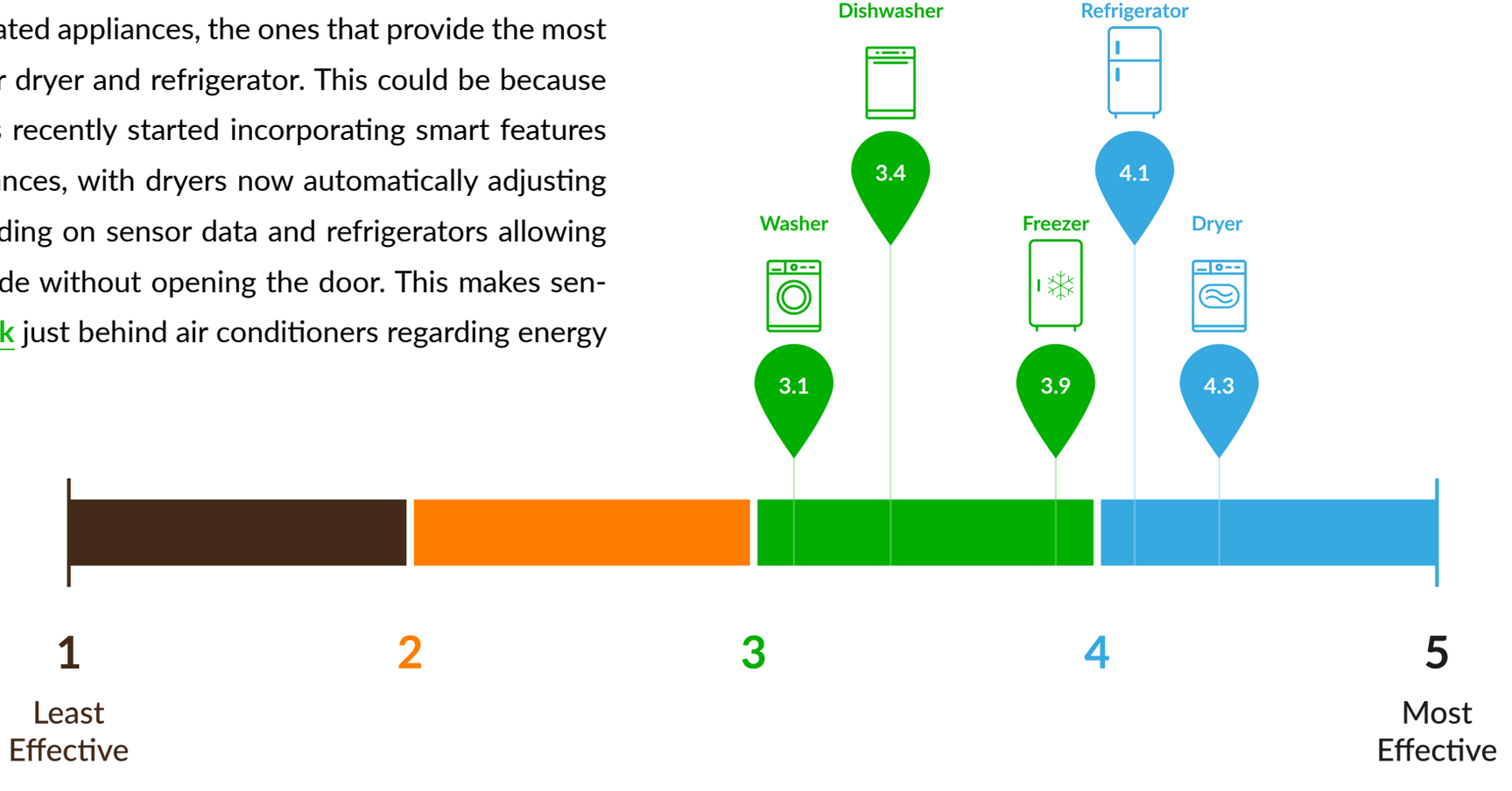
While smart home devices such as Amazon's Echo and Google Home can be used in a variety of ways to improve home energy-efficiency, the majority of experts, 44%, believe that homeowners will be using it mostly to control lighting. Smart homes are growing in popularity, up from 0.5% in 2010 and projected to hit 10% by 2025. So, it stands to reason that these devices will begin to gain traction in energy savings as well.



I. Appliances and Home Electronics

1. 2. How much of an effect would each of the following appliances have on annual energy savings if updated to Energy Star rated or better?

Experts were asked to rate which appliances they felt were the most likely to be effective on a scale of 1 to 5, with 5 being the most effective. Most home experts agree that when it comes to Energy Star rated appliances, the ones that provide the most savings are your dryer and refrigerator. This could be because Energy Star has recently started incorporating smart features into their appliances, with dryers now automatically adjusting the time depending on sensor data and refrigerators allowing you to look inside without opening the door. This makes sense as dryers rank just behind air conditioners regarding energy usage.



I. Appliances and Home Electronics

1. 3. Which small appliance wastes the most energy without the homeowner realizing it?

36% of experts say that electric space heaters are the biggest unconscious waste of energy. Most people use them in conjunction with their main heat source, causing energy bills to rise. Window air conditioners rank second at 32%. According to The U.S. Department of Energy, when they are used alone, they save money but are overall less efficient than entire house systems.

36% Say **Electric space heater**

32% Say **Window air conditioner**

12% Say **Countertop kitchen appliances**

12% Say **TV cable boxes**

8% Say **Room dehumidifier**

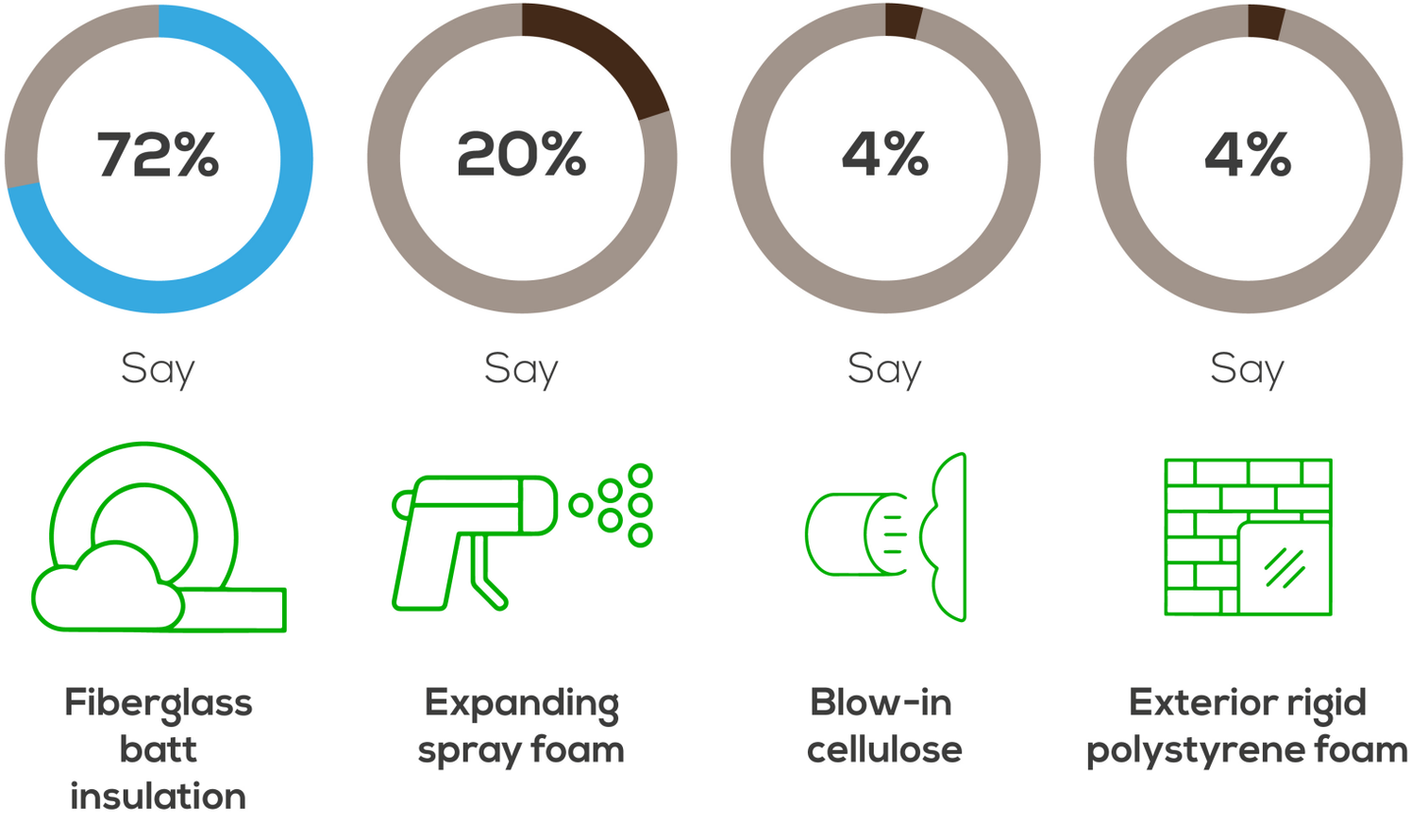
REPORT
2019

II. Building Envelope
(Insulation and air sealing, windows, doors, and skylights)

II. Building Envelope

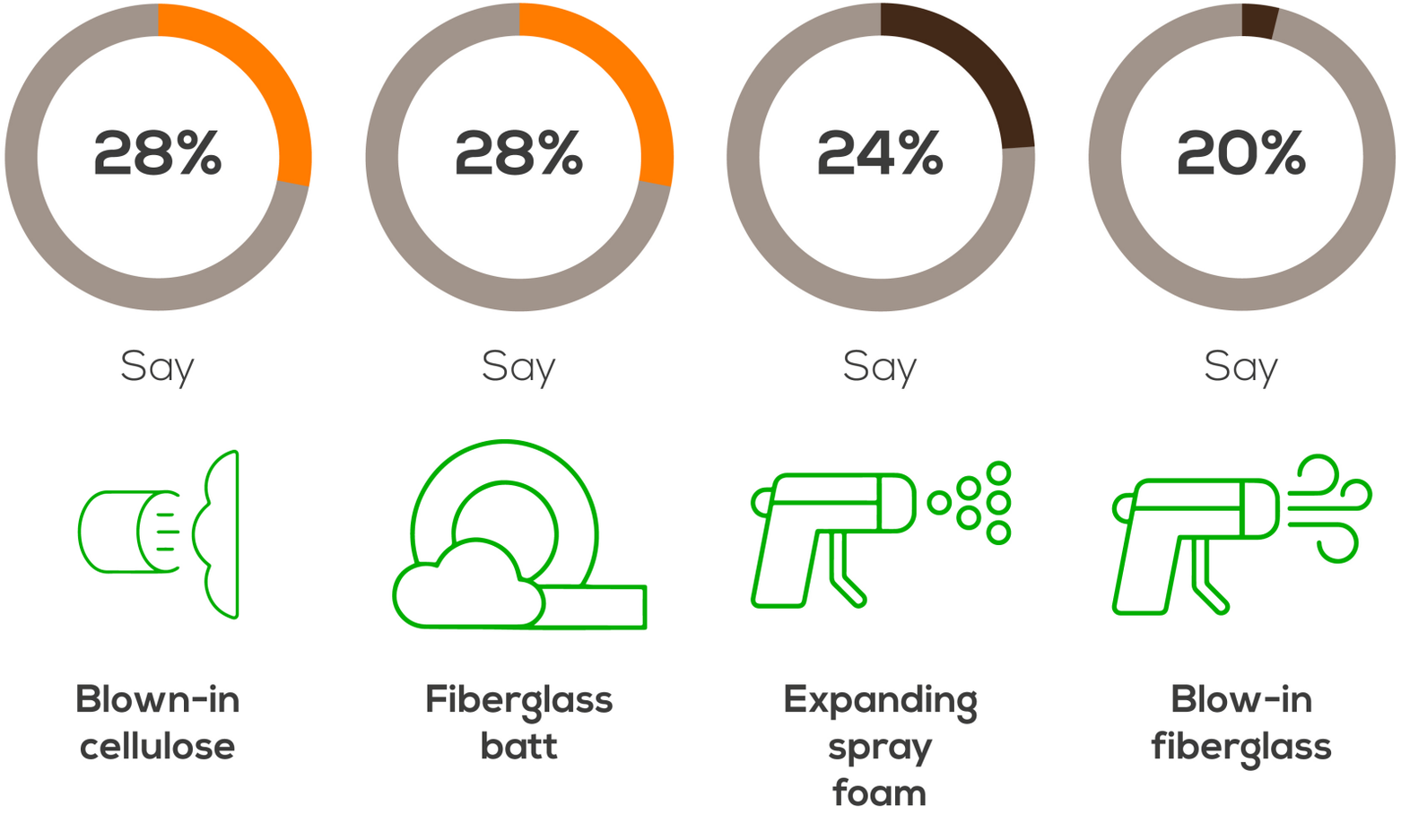
2. 1. What type of exterior wall insulation is the most popular?

Tight building envelopes are all the rage, helping to keep energy costs down passively by eliminating thermal transfer from inside to out. Of the various materials available, 72% of experts like fiberglass batt insulation, while 20% say that spray foam insulation is the more popular method. This could be due to reports that foam insulation creates such a tight building envelope that it creates moisture problems inside the walls. For older homes that have no insulation in the exterior walls, fiberglass batts are the more popular option because they are easy and inexpensive to install.



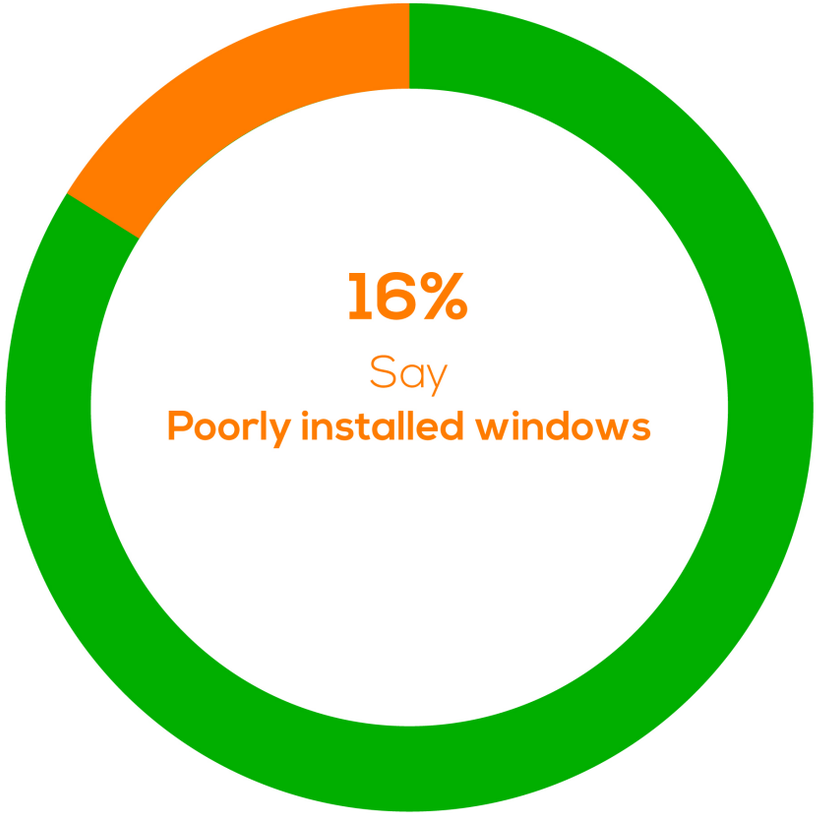
2. 2. What type of attic insulation is the most popular?

When it comes to attic insulation, experts are tied at 28% for both blown-in cellulose and fiberglass batts. While fiberglass batts are considered less effective, they are readily available, easy-to-install, and less expensive than the more effective blown-in cellulose. Cellulose insulation is more effective at insulating but does take a professional to install properly, influencing its popularity as well.



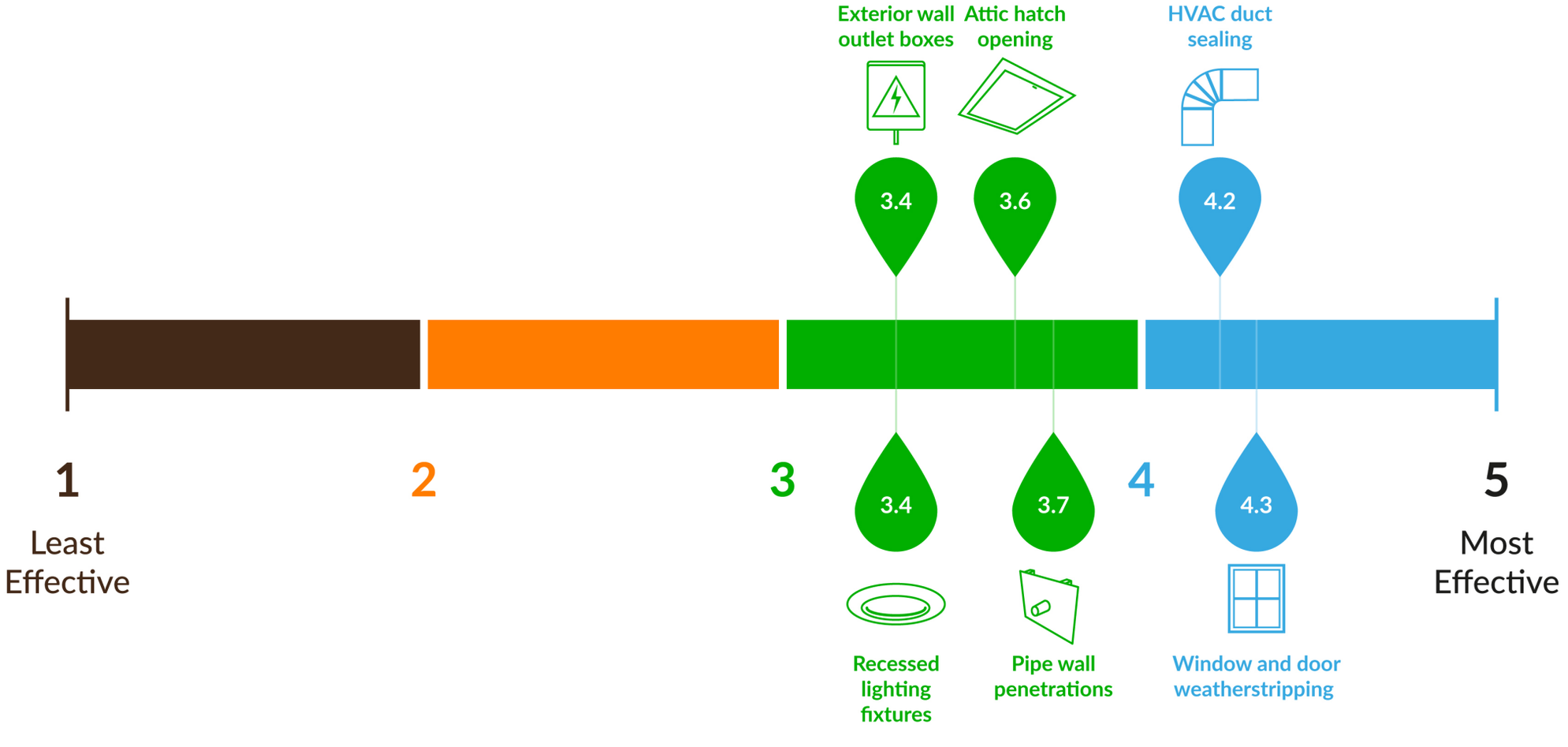
2. 3. What type of old windows are most replaced with higher-efficiency ones?

The overwhelming majority of experts at 84% say that the most commonly replaced type of window is the older single-pane variety. These windows have only a single pane of glass in an older metal or wooden frame. Only 16% believe that a poorly installed window, such as a cheap vinyl window in a historical home, is the reason behind the switch. According to Energy Star, windows are the source of as much as 25 to 30% of energy lost from the home, particularly older, single-pane windows, which may explain why this is the most commonly replaced type.



2. 4. How much of an effect would the following types of air sealing have on energy-efficiency improvement?

Experts were asked to rate the effectiveness of each option on a scale of 1 to 5, with 5 being the most effective. Window and door weatherstripping just edges out HVAC duct sealing at 4.32 vs 4.24. The U.S. Department of Energy explains that weatherstripping is one of the easiest and most noticeably effective ways to seal a home, which could explain why this type of sealing leads.



II. Building Envelope

2. 5. Which advanced envelope technology will see the greatest increase in popularity in the next five years?

A tight building envelope, or an exterior that is completely sealed against air and thermal transfer, is becoming the goal for most builders and homeowners. According to experts, 32% say that structural insulated panels (SIPs) will be the method that will see the biggest upswing in popularity within the next five years.

32% Say **Structurally insulated panels (SIPs)**

24% Say **Radiant barrier**

20% Say **Insulated concrete forms (ICFs)**

16% Say **Staggered, double-stud exterior wall**

4% Say **Phase change materials**

4% Say **Thermal mass storage**

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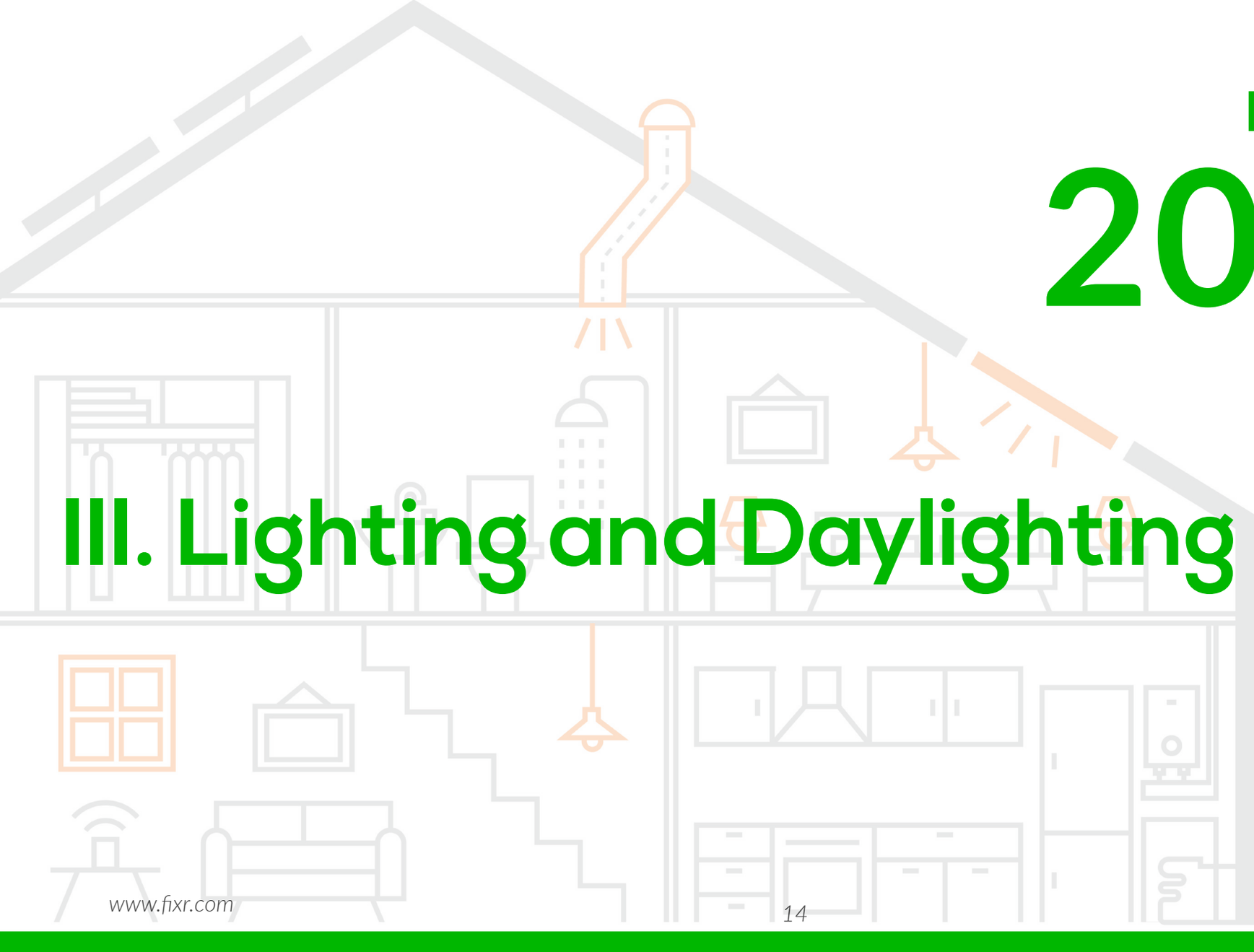
III. Lighting and Daylighting



III. Lighting and Daylighting

3. 1. According to a U.S. Energy Information Administration study, 71% of homes still do not use any LED lights. What will be the biggest factor to change this in the next five years?

Despite the fact that the U.S. Energy Information Administration reports that 71% of homes have yet to make the switch, LED bulbs are considered one of the most efficient ways of lighting your home, but not many households currently use them. 56% of industry experts believe that more homes will use them in the future as the cost of the bulbs drops. 24% also believe that as word gets out about the amount of savings that can be had from this technology, the number of people adopting them will also grow.

56% Say **Lowered cost of LED bulbs**

24% Say **Increased awareness of savings**

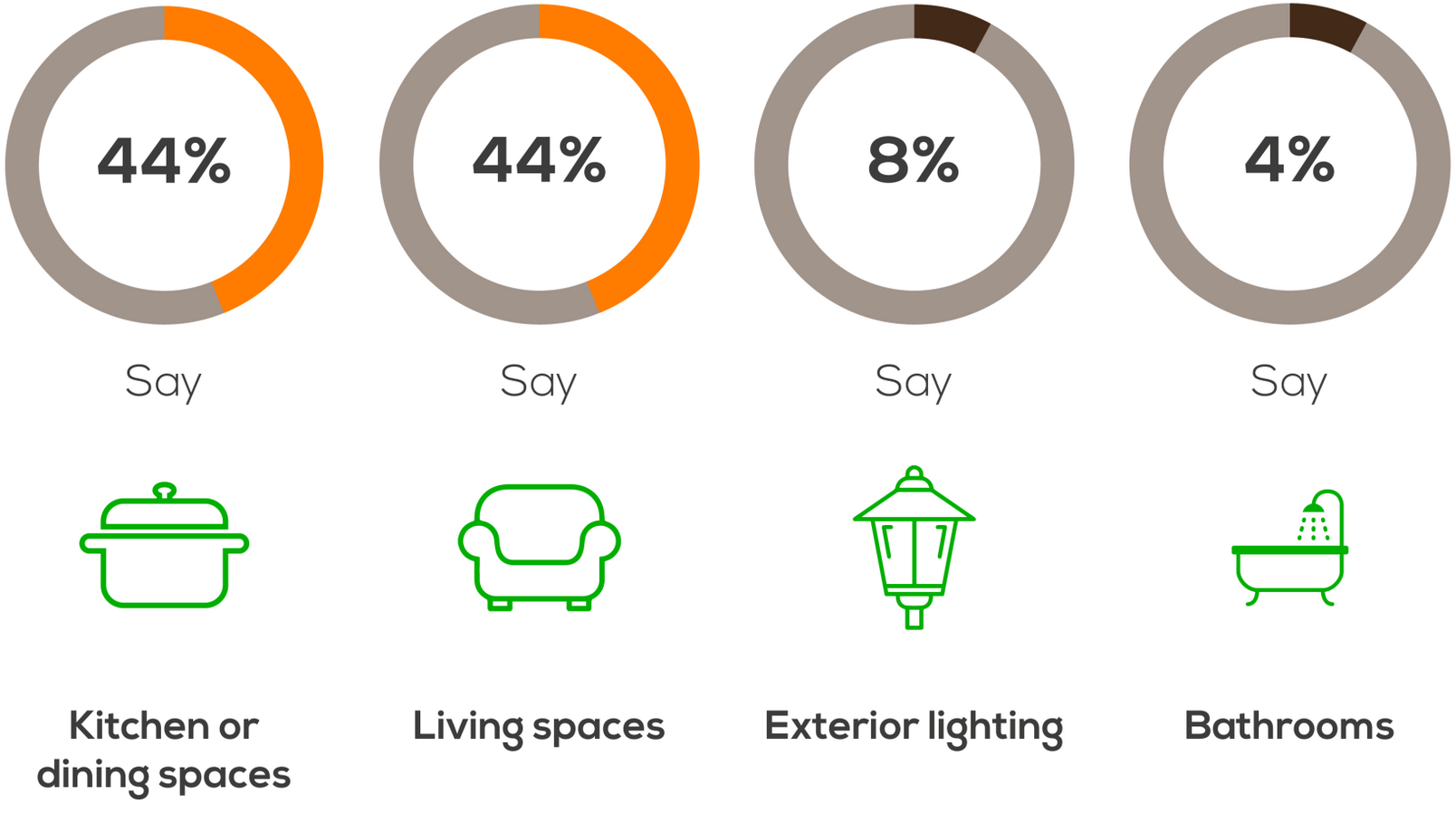
16% Say **Increased awareness of the technology**

4% Say **Increased realibility of LED bulbs**

III. Lighting and Daylighting

3. 2. What area(s) of the home has the greatest opportunity for energy savings from lighting upgrades?

Experts are split fairly evenly on the area of the home they feel would benefit most from energy savings in lighting upgrades. 44% say that kitchen and dining spaces would see the most benefit, while another 44% believe that it would be the living spaces. This could be because these are the areas most likely to use task lighting, which is considered essential for close work like reading to help protect the eyes.



III. Lighting and Daylighting

3. 3. How can homeowners make better use of daylighting to reduce the need for electrical lighting?

In the case of natural or daylight, most experts agreed that it was an important component in any room. According to an expert, Eric Corey Freed, you should never need to use lights during the day. For how to achieve this goal, experts repeated many suggestions, with adding skylights or solar tubes ranking high, and like Anne Fougeron suggests, “Making use of windows, shades and blinds to control the sun throughout the day.”

Since the majority of people spend their **time indoors** when they return home from work, these suggestions can go a long way toward making the space both more functional and more energy-efficient.

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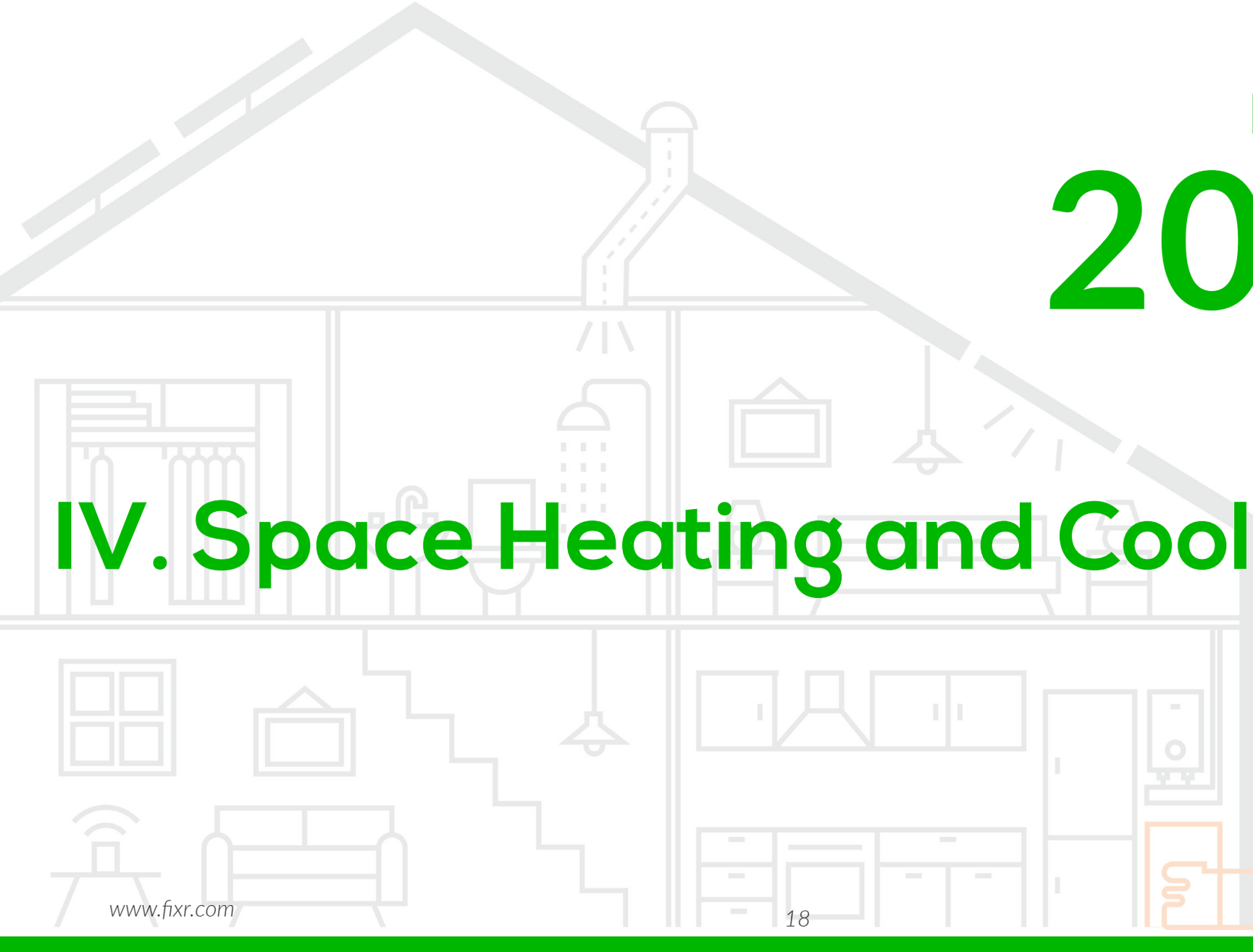
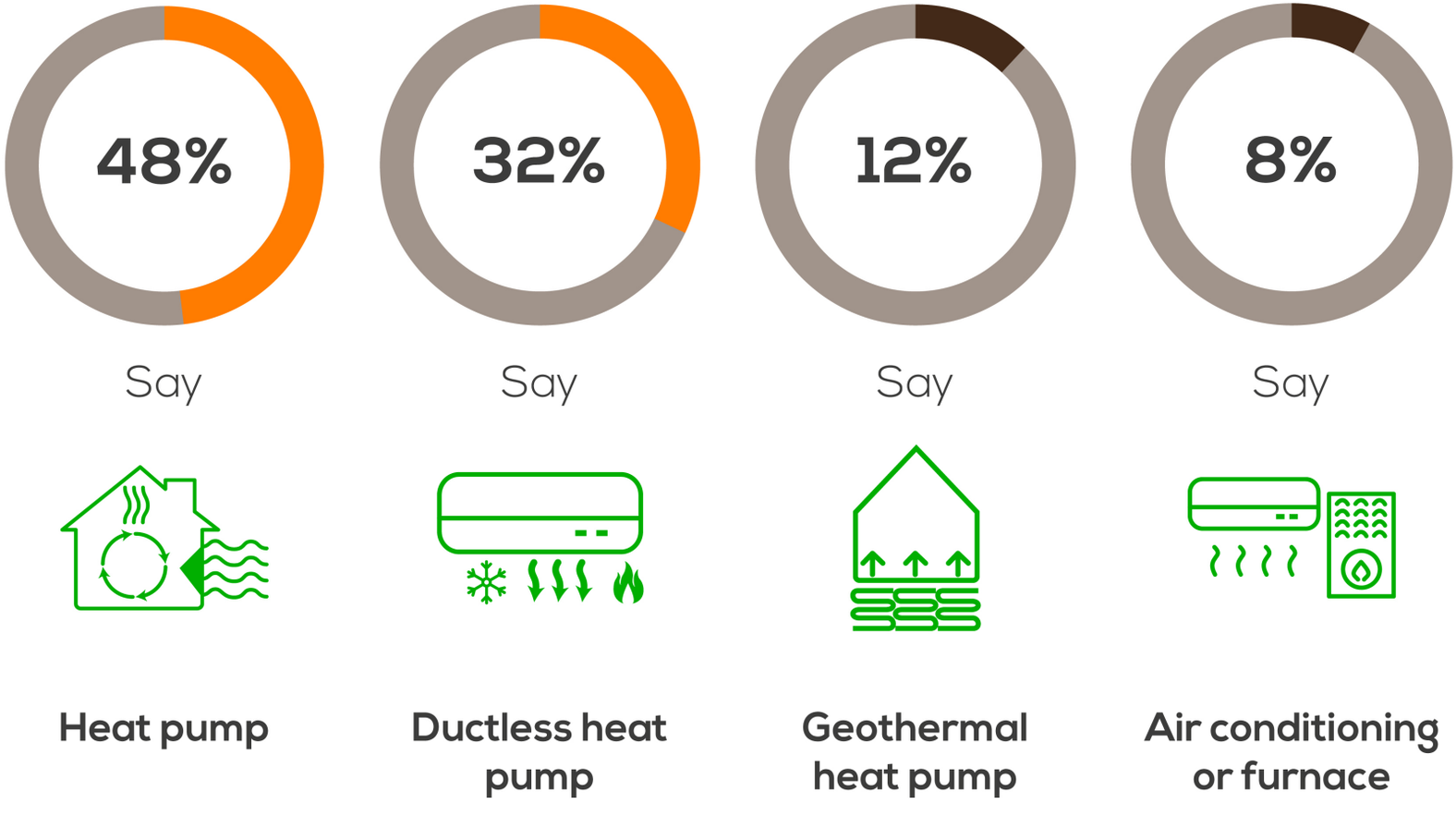
IV. Space Heating and Cooling



IV. Space Heating and Cooling

4. 1. What type of heating and cooling systems are the most installed in energy-efficient homes?

48% of experts believe that heat pumps are the most commonly installed heating system in an energy-efficient home. Heat pumps are considered to be at least 50% more efficient when compared to electric resistance heating systems, such as furnaces and base-board heaters, according to the U.S. Department of Energy. Electric heat pumps are the easiest to retrofit, which may explain why they are more popular than geothermal heat pumps in 12% of homes.



IV. Space Heating and Cooling

4. 2. What is most important when considering using heat recovery ventilators (HRVs) or energy recovery ventilators (ERVs)?

If using a heat recovery ventilator or energy recovery ventilator, 58% of experts say that a tight building envelope with minimal air leakage is the most important component to the design. Both systems rely heavily on air flow, intake, and the right type of ventilation. Having an air leak or thermal transfer could upset the calculations, making the systems less effective.

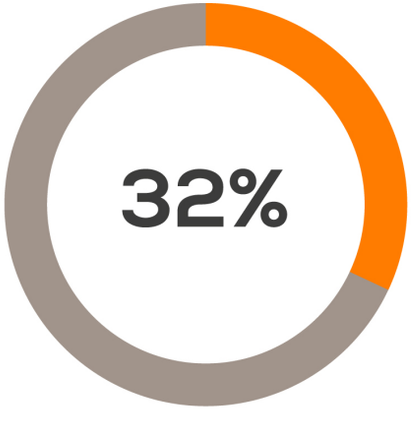
58% Say **Tight building envelope with minimal air leakage**

21% Say **Ductwork that is either tightly sealed or within conditioned space**

21% Say **High-efficiency HVAC equipment**

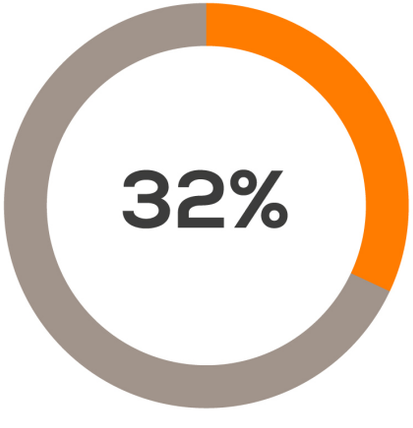
4. 3. How often should air filters be changed to maintain peak efficiency of heating and cooling equipment?

Experts are split three ways on how often they feel air filters should be changed to maintain peak efficiency in an HVAC unit. 32% feel that once a month, every three months, and every six months are all the correct answer. The timing between air filter changes depends on many factors that can differ from home to home.



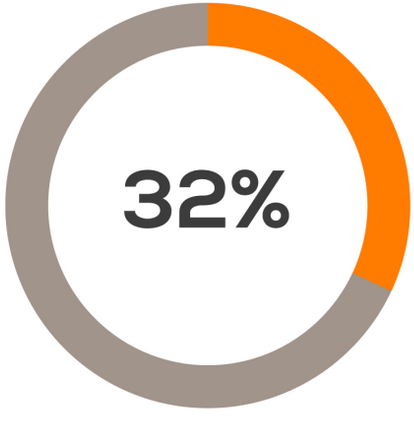
Say

Every 3 months



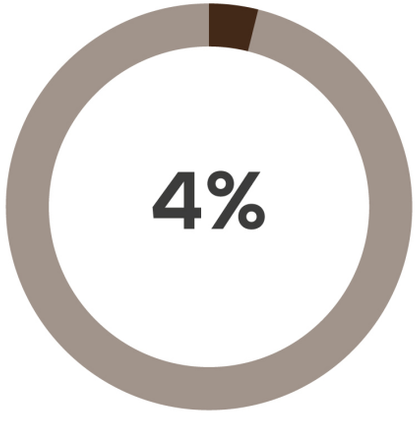
Say

Every 6 months



Say

Once a month



Say

Once a year

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V. Water Heating

V. Water Heating

5. 1. What type of water heaters are most popular when considering energy usage?

The majority of the experts at 48% say that tankless, gas heaters are the most popular for saving energy while heating the water in a home. According to the U.S. Department of Energy, the average family can save about $100 a year by switching to a tankless heater.

48% Say **Tankless gas**

20% Say **Tankless electric**

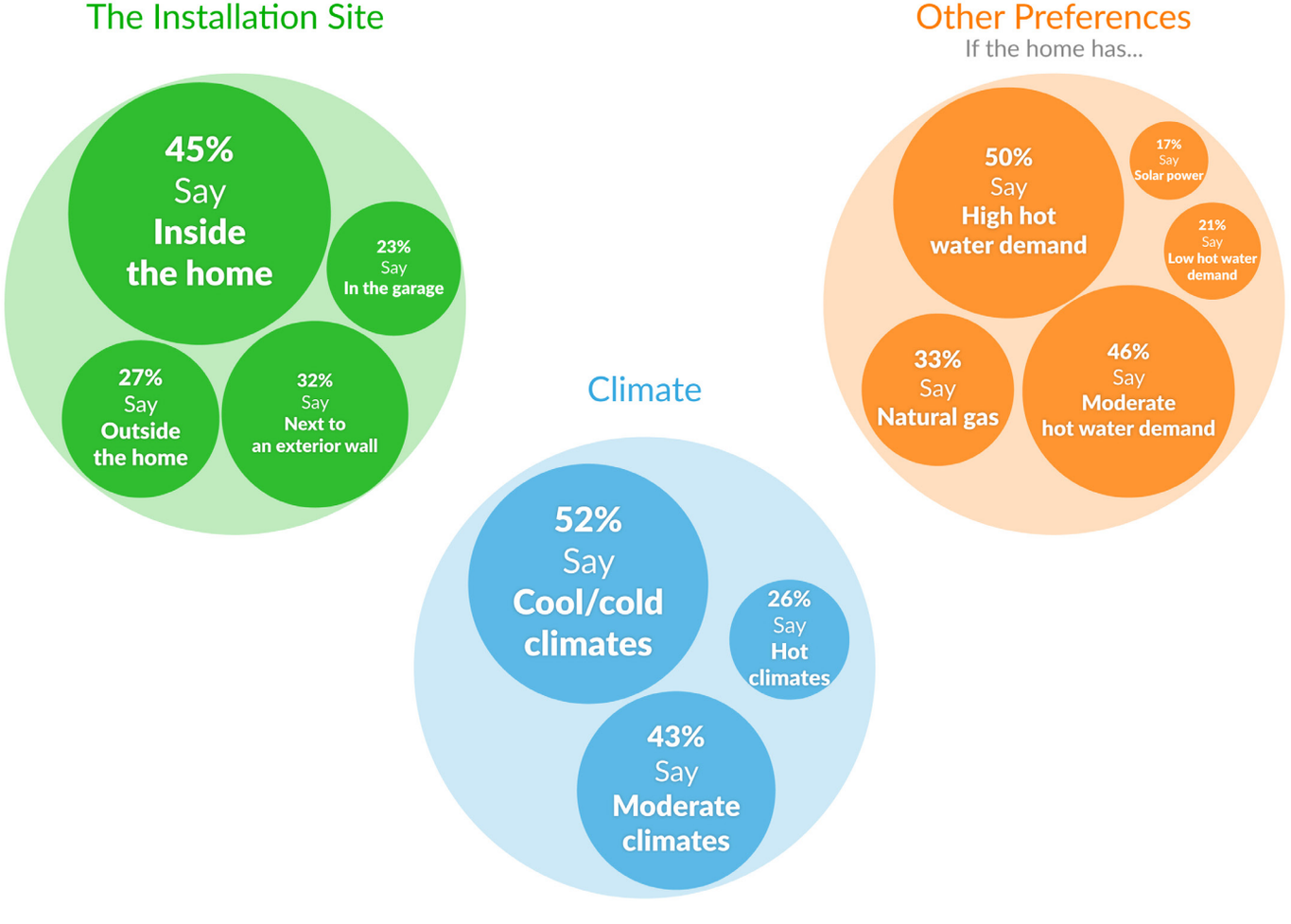
16% Say **Hybrid-electric**

12% Say **Solar hot water**

4% Say **Storage tank gas**

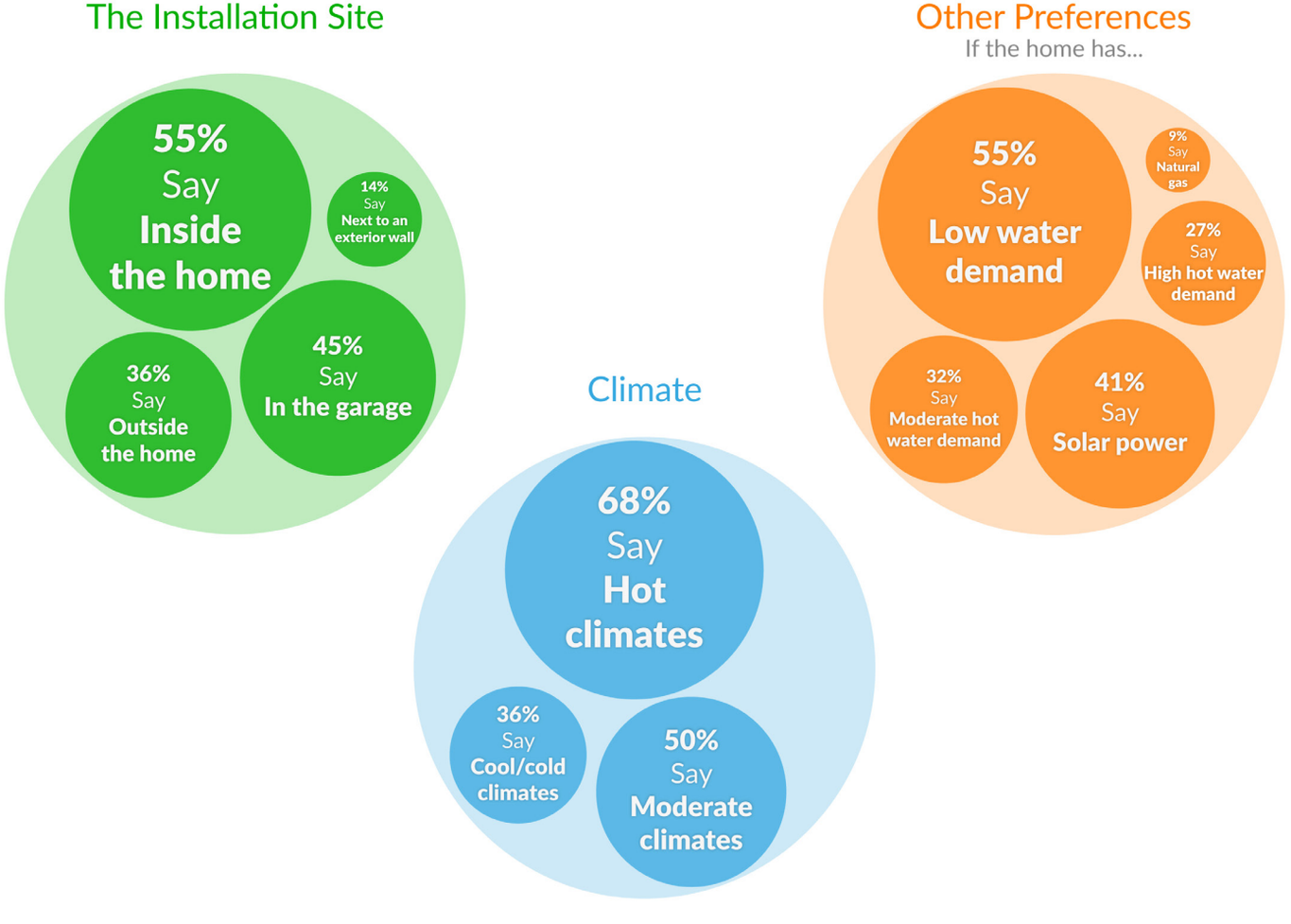
5. 2. When is a tankless water heater (electric or gas) more advantageous than a hybrid heat pump water heater?

Answers are more varied on when a tankless heater may be a better fit than other kinds of hybrid. In general, experts felt that cold climates, excessive hot water use, and the area it will be installed (interior) have the biggest impact. Experts were encouraged to choose all options that applied to each category, which helped determine the results. According to the U.S. Department of Energy, tankless options may also be a better choice because they do not lose efficiency based on location or the time of year they are used.



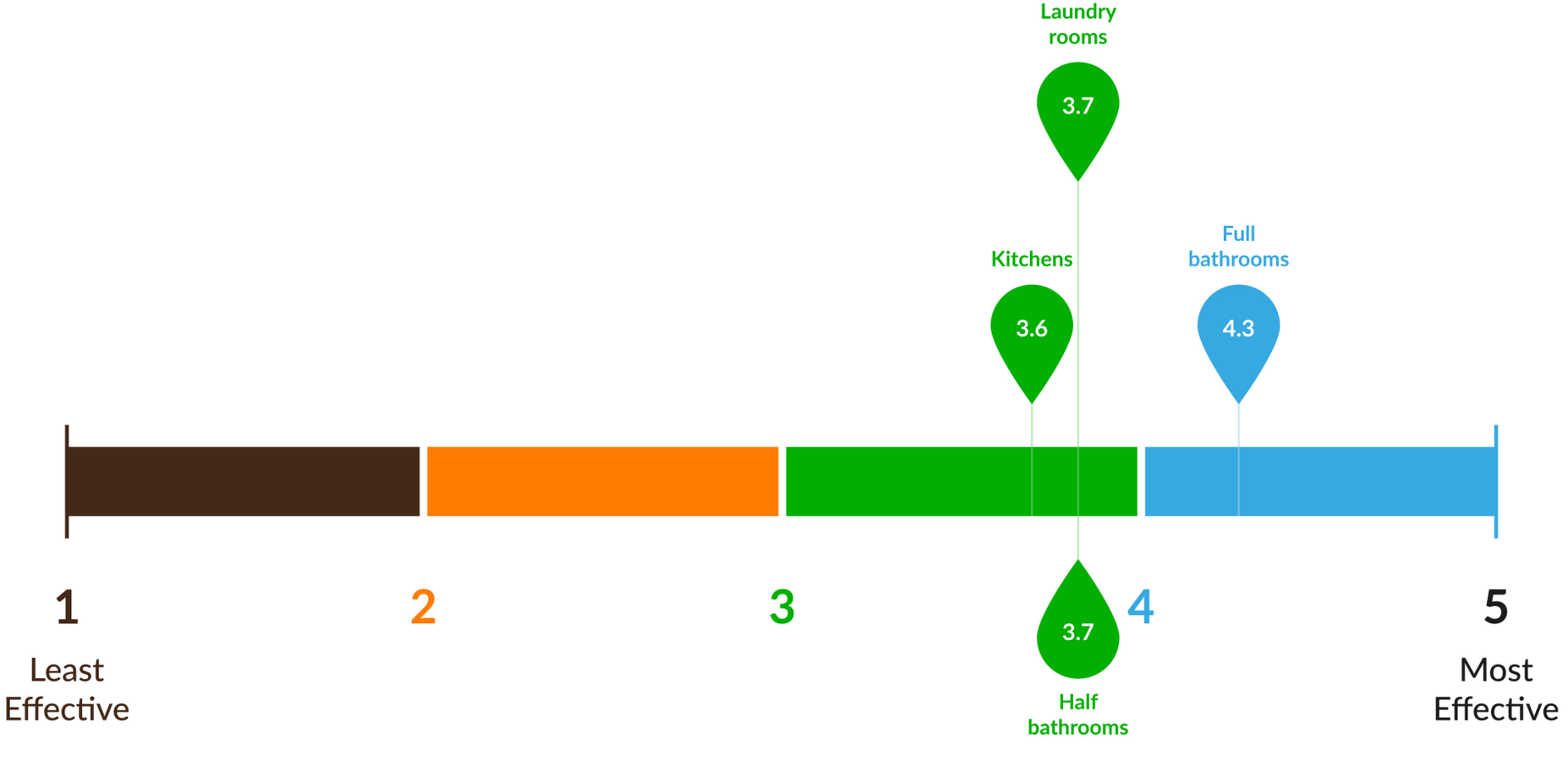
5. 3. When is a hybrid heat pump water heater more advantageous than a tankless water heater?

Experts were asked to choose all categories that applied when answering this question. In the case of hot climates, low demand for water use, and an interior installation, most experts agree that a heat pump/water heater hybrid is the better choice. Despite these conditions for use, according to the U.S. Department of Energy, hybrids still lose the same amount of energy as a standard heater, which may cause some homeowners to rethink this choice.



5. 4. How effective are flow fixtures in the following areas?

Experts rated effectiveness on a scale of 1 to 5, with 5 being the most effective, and determined that when it comes to the effectiveness of flow fixtures, full bathrooms rank the highest on average with laundry rooms coming in second. No matter how you slice it, water usage per household breaks down to roughly 60 gallons per person per day without low-flow fixtures added. Restricting flow in any area is sure to help reduce this load.



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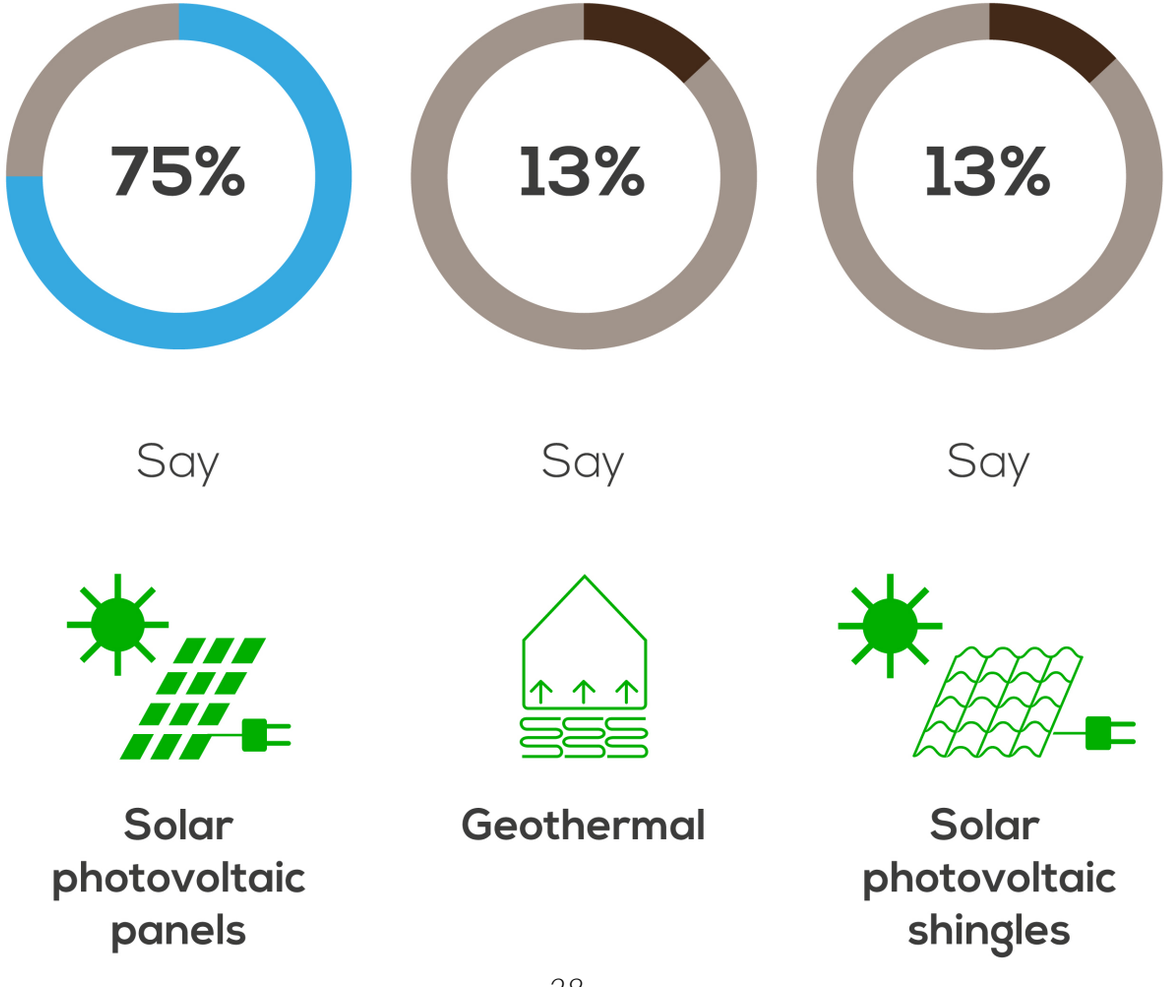
VI. Renewable Energy and Generation

VI. Renewable Energy and Generation

6. 1. What type of renewable energy is most popular in single-family homes?

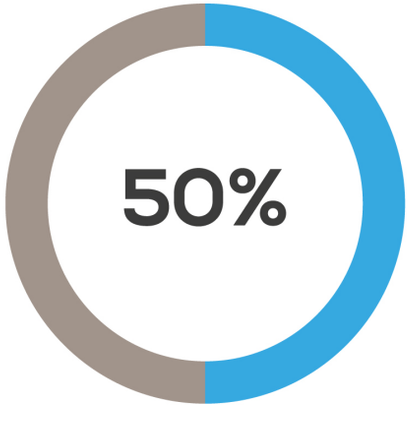
Solar and photovoltaic panels are the most popular form of renewable energy in single-family homes by far at 75%. Larger percentages of renewable energy are being recorded nationwide as well, with solar ranking high everywhere. The panels are easier to locate, which may explain why solar beats out the more commonly used hydropower for single-family houses.



VI. Renewable Energy and Generation

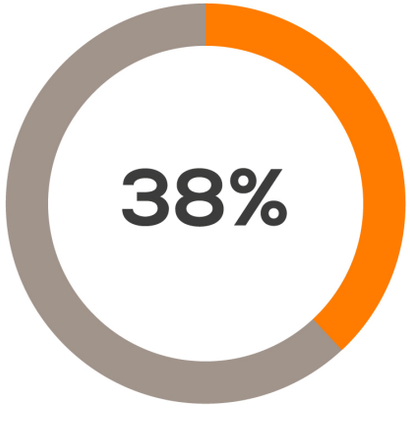
6. 2. What age demographic will most likely invest in renewable energy?

When it comes to who will invest in renewable energy, 50% of experts say millennials, while 38% say Gen Xers. This is certainly in line with **current trends** because millennials want cleaner energy sources either directly in their homes or from a purchasable source.



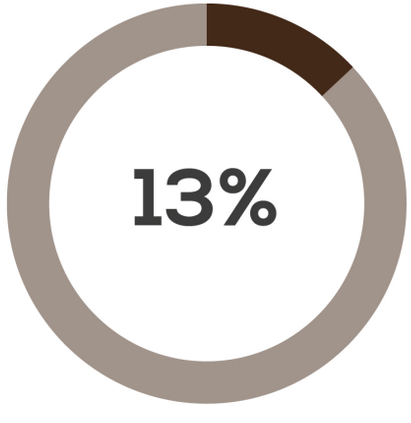
Say

Millennials (1982-2004)



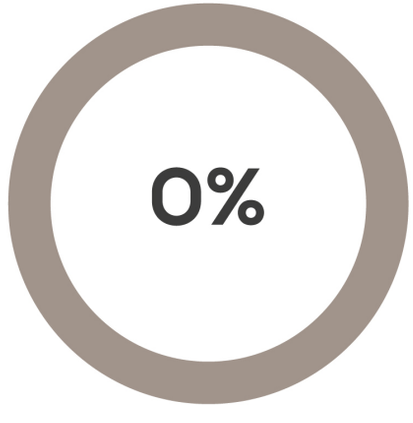
Say

Generation X (1961-1981)



Say

Baby boomers (1946-1964)



Say

Silent generation (1925-1945)

6. 3. Describe the ideal candidate for solar energy.

Experts feel that the ideal candidate will likely have to do with the home itself and its position. According to Charles Hendricks, the ideal candidate would be “Anyone with a south-facing, unshaded roof.” Others, like Toni Lewis, feel that the ideal candidate is someone who could make the most of the energy, “Any house with good solar exposure and an average or above-average energy demand. It’s especially advantageous for households with an electric car, and/or a swimming pool.”

When considering the homeowners themselves, other experts had more to add. Karan Gupta feels that a good candidate would be an “Empty nester with money to spare. Preferably in a state with good incentives.” Lee Calisti also adds that an ideal candidate such as “A young homeowner that intends to stay in the house indefinitely will likely see the cost benefit, as well as enjoy knowing the effort meant something more than cheap energy.”

VI. Renewable Energy and Generation

6. 4. What is the most common application of energy storage (batteries)?

When it comes to the storage of energy in batteries, 46% of experts feel that most people use them as a time-of-day tariff arbitrage. The purpose of batteries, however, is to help provide a more continuous energy source. So, it may be that most homeowners do not understand the purpose of their batteries or how to use them properly.

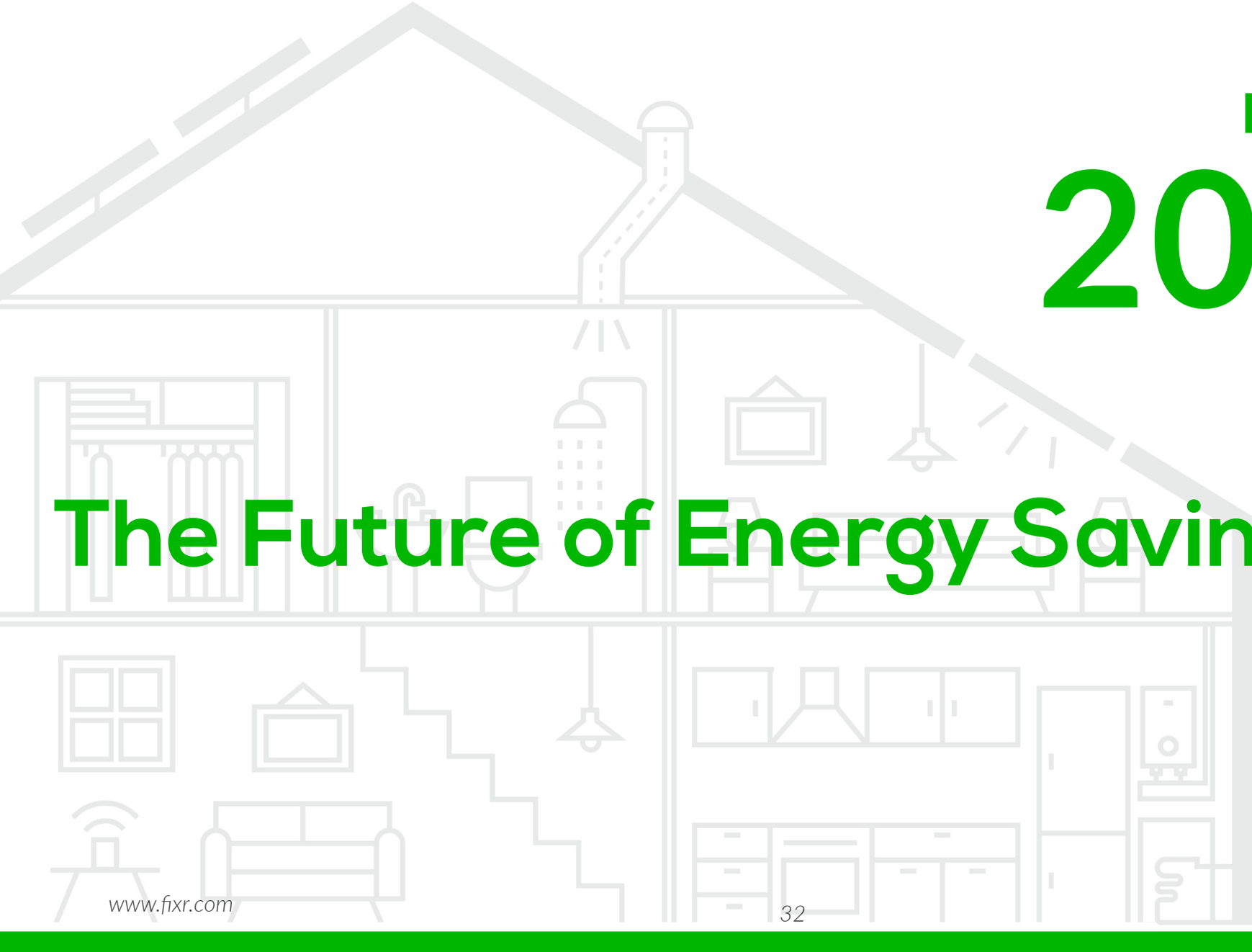
46% Say **Time-of-day tariff arbitrage**
(store energy when it is cheap and use it during peak rates)

25% Say **Protect against grid outages like a backup generator**

13% Say **Demand control (lower peak demand)**

13% Say **Off-grid applications**

4% Say **Energy wholesale market participation**
(frequency regulation, ancillary services, etc.)



REPORT

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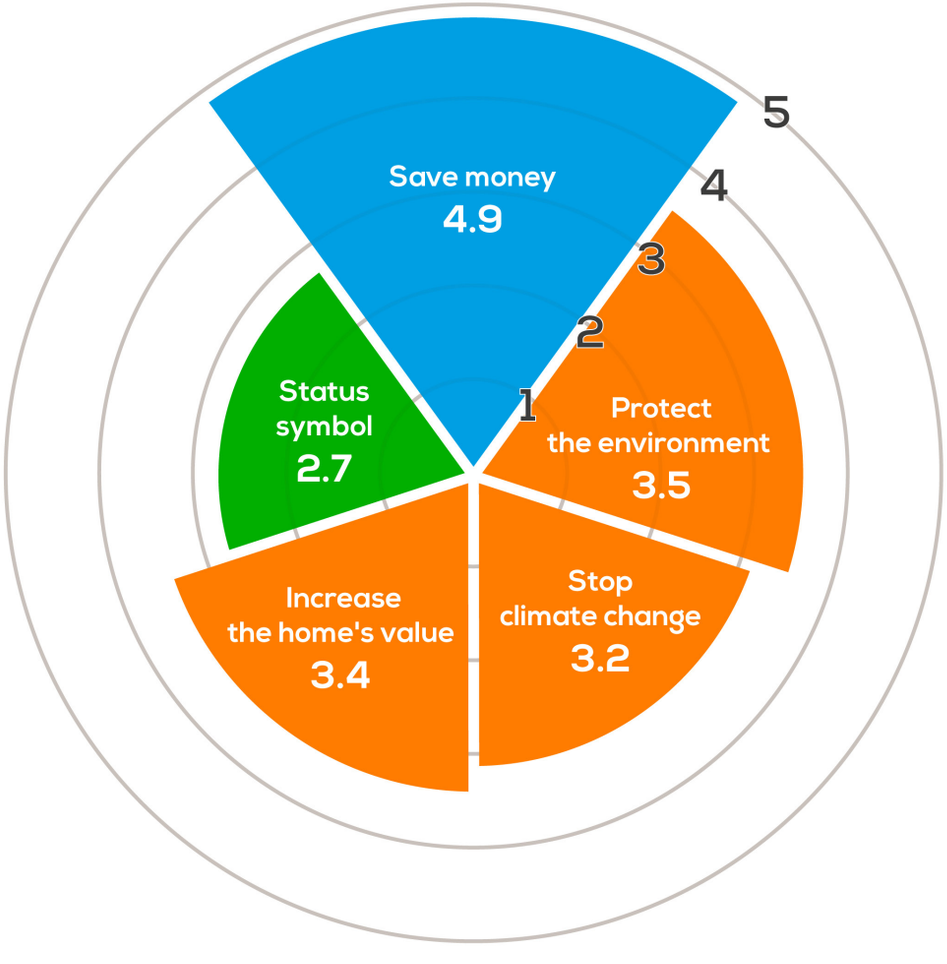
The Future of Energy Savings

The Future of Energy Savings

What factors do you think motivate homeowners to make energy-efficient purchases?

Experts were asked to rank homeowner motivations on a scale of 1 to 5, with 5 being the most likely reasons behind this motivation. It seems that when it comes to reasons why people may invest in energy-saving resources for their homes, saving on utility bills ranks the highest at 4.88. Since it is possible to save as much as $1,182 a year on energy bills simply by making small changes, it seems true that most people will be motivated by this savings.

Coming in second is a desire to help the environment at 3.50. This is in line with the fact that 74% of Americans feel that steps should be taken to help protect the environment.



The Future of Energy Savings

With the problematic impact of climate change becoming more and more clear, what would a future "climate-proof house" look like?

While experts seemed hesitant to say what a climate-proof house would look like, some approached this question with their own foresights.

Most experts agreed, however, that insulation would be important. Karen Gupta gave the answer with the most thought, positing that the ideal house would have a "Superinsulated, airtight, durable building envelope with triple-glazed windows. It would utilize passive solar techniques and would use a suitable foundation type for the local water regime. It would be net-zero or net-positive, with energy storage. It would also have rainwater collection, and perhaps some sort of wastewater treatment (or septic tank or composting toilet). In fire-prone areas, it would have fire-resistant properties. It would not be excessively large and would use efficient lighting and appliances. Landscaping would also be important, best with some on-site food production."

Other experts also agreed that net-zero houses with access to several renewable energy sources such as solar, wind, and geothermal energy would be a solution for climate proofing. Scott Bergford adds, "and net-zero energy use homes that also address water conservation and recycle."

Conclusion

The experts polled in this survey have given homeowners and other industry professionals valuable insights into the way that energy-efficient design impacts the home design field. With information on trends like this, homeowners can make better decisions for their homes, such as the appropriate type of insulation, where to focus on air sealing, and when to replace windows.

Other industry professionals will also benefit by understanding who their target audiences are, such as millenials, and what homeowners are looking for, such as smart and energy-efficient appliances as well as how they should invest their money in order to save and what drives these decisions.

Paying attention to industry trends always pays off. Consider these and other survey results from Fixr to make better, more informed choices about the homes you build and live in.

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Methodology

Methodology

To find the best experts to assist in this survey, we reached out to 25 industry professionals from Fixr's 2019 Experts' List to ask them to select one answer or several to each question that they felt best captured industry trends in each category. They were also asked to answer open-ended questions on each topic to provide a clearer picture.

Fixr selects experts within the U.S. construction industry who are building, designing, manufacturing, and publishing content relevant to the field.

We selected the experts for this list based on criteria such as:

- Their experience in the industry
- Any awards won
- Their online presence, including web traffic or social channels, and how often their name or business appears online
- Their contributions to other publications or external organizations

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Survey Contributors

Survey Contributors

• Adam Helfman – Host, HireitDone.com
http://hireitdone.com/

Adam created Hire it Done to provide resources to homeowners who are not interested in the DIY movement. The website allows homeowners to find prescreened contractors, access resources, and ask questions. Adam has hosted various radio and television shows and has more than 25 years of experience in the home improvement industry.

• Anne Fougeron – President, Fougeron Architecture
http://www.fougeron.com/

Anne utilizes tactile materials and natural light to create modernist designs that are nationally recognized. Her Big Sur-based firm employs 14 architects and designers. Anne's work focuses on the placement of natural light, and her unique process keeps design and construction together.

• Anwar Khalifa – President, Pyramid Homes
http://www.buildpyramid.com/

Anwar has been with Pyramid Homes in North Carolina for more than 25 years. A certified green professional builder, Anwar makes energy-efficient and healthy home design and construction a priority. He is the current President of the "Green" New Home Design & Construction segment of Pyramid.

• Bob Borson – Principal, Malone Maxwell Borson Architects
http://www.lifeofanarchitect.com/

Bob is one of the principal architects at Malone, Maxwell, Borson Associates. He was a winner of the Young Architect of the Year award in 2009 and works today on primarily modern residential projects. He is active in the American Institute of Architects where he has held several roles.

Survey Contributors

• Brinn Miracle – Senior Associate, Kirksey Architecture
http://architangent.com/

In addition to earning both her bachelor's and master's degrees at Texas Tech University, Brinn spent a summer studying architecture in eight different European countries. Noteworthy projects include a casino with a hotel and several buildings at South Texas College. In addition to being a senior associate at Kirksey Architecture, Brinn also runs Architangent, an online blog dedicated to architecture.

• Charles Hendricks – Architect, The Gaines Group, PLC
http://thegainesgroup.com/

Charles is an architect with The Gaines Group, a firm that believes that through design, we can have a better future. Charles is also the sustainability and marketing director for the firm, which handles all angles of design from consultation through interiors. Charles focuses on durable, energy-efficient buildings throughout Virginia's Shenandoah Valley. He works on both residential and commercial projects and has received a number of "Best of Houzz" awards for customer satisfaction and design.

• Dan Brunn – Founder, Dan Brunn Architecture
http://www.danbrunn.com/

Dan is the founder of Dan Brunn Architecture, a firm that specializes in clean, functional modernism in design. DBA creates architecture that respects the site its built on, with modern and dynamic designs that are purposeful, timeless, and inherently aesthetic. Dan has worked on several high-profile residences from coast to coast, from the Breakers to LA homes designed by Frank Gehry.

• David Bourbon – Architectural consultant
https://www.linkedin.com/in/davidbourbon/

David is an architectural consultant in Wichita, Kansas. He was previously a project manager at several high-profile architectural firms as well as a university professor focusing on building codes, interior drawing, and quality assurance.

Survey Contributors

• Ehron Nygar – CEO, Decor Design Build
http://www.decordesignbuild.com/experience.html

Ehron is the CEO of Decor Design Build, located in the greater Chicago area. Ehron has been building for more than 23 years and has worn many hats in the design industry including project manager, field manager, and superintendent. He works to add value to the world through his everyday life.

• Eric Crey Freed – Founding Principal, organicARCHITECT
http://www.organicarchitect.com/

Eric is the founding Principal of organicARCHITECT as well as a licensed architect in California, New Mexico, and Arizona. Eric is one of the recognized leaders in the field of organic architecture - a field first begun by Frank Lloyd Wright. Eric is originally from Philadelphia and began his career in Philadelphia and New York.

• Ian Busch – Energy Analyst, EnergySoft
http://www.energysoft.com/

Ian is an energy consultant at EnergySoft. He graduated from Sonoma State University with a degree in Environmental Studies focusing on Energy Management and Design. Passionate about the environment, he helps steer people toward making the right decisions about energy management in their homes and businesses.

• Jeffrey Pelletier – Principal and Owner, Board & Vellum
http://www.boardandvellum.com/

Based in Capitol Hill, Seattle, Jeff and his firm have contributed to countless projects throughout the area, including residential, retail, commercial, and multi-family. He has grown Board & Vellum to more than 20 employees and earned the Puget Sound Business Journal's "40 Under 40" Award. Board & Vellum prides itself on not being your typical design firm, keeping an emphasis on the homeowner's dreams and plans.

Survey Contributors

• Karan Gupta – Energy-Efficient Design Specialist, Build SMART
https://www.buildsmartna.com/

Karan is an Energy-Efficient Design Specialist at BuildSMART, a firm specializing in creating durable, super energy-efficient homes, including passive homes. Karan graduated from New York and Duke Universities with degrees in Environmental Studies, Energy and Environment, and Forest Resource Management.

• Lain Chappell – Owner, Solid Rock Custom Homes
http://www.solidrockcustomhomes.com/

Lain is the Owner and President of Solid Rock Custom Homes, located in Colorado Springs. Lain is a certified Graduate Remodeler of the National Home Builders Association and holds a general contractor's license with the Pikes Peak Regional Building Department. He has worked in the Pikes Peak area for more than 17 years.

• Larry Kush – Senior Vice President, ORION Investment Real Estate
http://www.orionprop.com/

An Army veteran of Vietnam, Larry has successfully led three home building companies in Arizona. He received awards twice as Marketing Director of the Year. Larry is a leader throughout the Southwest and currently serves as a planning commissioner for the City of Scottsdale. Having worked in the industry for more than 35 years, Larry is also an honorary life board member of the Home Builders Association of Central Arizona.

•Larry Zarker – CEO, Building Performance Institute
http://www.bpi.org/

Based in Washington, D.C., Larry brings more than 30 years of experience to the table. He is the current CEO of the Building Performance Institute, a company offering certifications in building knowledge. Larry focuses on changing the way people build and live in their homes for the better.

Survey Contributors

• Lee Calisti – Principal, lee CALISTI architecture+design
http://www.leecalisti.com/

Based in Greensburg, Pennsylvania, Lee focuses on both new construction and reuse projects at the commercial, institutional, and residential levels. Lee has served as an adjunct associate professor at Carnegie Mellon University's School of Architecture and blogs regularly at ThinkArchitect.wordpress.com. Lee takes a collaborative approach when working with clients and contractors to ensure that everyone is contributing to the design process on all levels.

• Lonnie Zboril – Owner/consultant, Z energy efficient building design
http://www.zenergyeffecientbuildingdesign.webstarts.com/

A master electrician in Caldwell, Texas for more than 30 years, Lonnie has made the switch to energy-efficient design. The owner of Z Energy Building Design, Lonnie now focuses on custom electric and energy designs for the entire design industry.

• Lora Teagarden – Project Architect, L² Design, LLC
http://www.l-2-design.com/

An Indianapolis-area native, Lora returned to her home city after several location changes following graduate school. She is LEED AP BD+C certified and has managed projects of all sizes. Her business began from the need for a creative outlet, and she believes that dreams and designs are always worth sharing.

• Mark English – Director, American Institute of Architects California Council
http://www.markenglisharchitects.com/

A San Francisco native, Mark studied architecture in Florence, Italy before starting his own firm. In addition to focusing on sustainable design, he also serves as the editor of two online magazines, The Architect's Take and Green Compliance Plus. Mark's focus is on creating a design that is sustainable, flexible, and built to last.

Survey Contributors

• Peter McMillin – Founder & CEO at Scott Homes, Inc.
http://www.scotthomes.com/

Peter is the Founder and CEO of Scott Homes, a family owned and operated design/build company that has been operating in the Puget Sound area for more than 30 years. Like all members of Scott Homes, Peter puts an emphasis on integrity, preservation of natural resources, and the reduction of energy consumption.

• Scott Bergford – Owner, Scott Homes, Inc.
http://www.scotthomes.com/

Scott is the owner of Puget Sound-based Scott Homes. A design/build company that has been operating for more than 30 years, Scott Homes puts an emphasis on the reduction of energy consumption and the preservation of natural resources in the homes they build.

• Steve Parker – President / COO, Park Square Homes
http://www.parksquarehomes.com/

Steve is the President and COO of Park Square Homes, a family owned and operated design and build firm. Park Square Homes is one of the first to build an Energy Star 3.0 home in 2012 and strives to build homes in the Central Florida area that enhance the community they are located in.

• Toni Lewis – Principal, Lewis / Schoeplein Architects
http://www.lewisschoeplein.com/

Toni focuses on urban projects, primarily in Los Angeles. She wrote her master's thesis on how small-scale architectural interventions can impact larger urban environments, a theory she lives out through her work each day. Toni is a third-generation Los Angeles native, and she has worked previously at the offices of Frank O. Gehry and Gensler.

Survey Contributors

• William Guajardo – Owner, J. G. Williams Construction
http://www.jgwilliamsconstruction.com/

Serving San Antonio and the surrounding area for more than 20 years, William is the owner and founder of J.G. Williams - a one-stop concrete construction company. A family owned and operated business, JGW handles all aspects of concrete construction from patios to large-scale commercial developments.

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Helpful Resources

Helpful Resources

Home Improvement Cost Guides Found in the Report

Appliances and Home Electronics

- **Home Automation Cost**
https://www.fixr.com/costs/home-automation

- **Install Electric Baseboard Heater Cost**
https://www.fixr.com/costs/install-electric-baseboard-heater

- **Window Air Conditioning Cost**
https://www.fixr.com/costs/window-air-conditioner-installation

Building Envelope (Insulation and air sealing, windows, doors, and skylights)

- **Home Insulation Cost**
https://www.fixr.com/costs/home-insulation

- **Attic Insulation Cost**
https://www.fixr.com/costs/attic-insulation

- **Room Insulation Cost**
https://www.fixr.com/costs/room-insulation

Helpful Resources

- **Home Air Sealing Cost**

https://www.fixr.com/costs/air-leaks-sealing

- **Cellulose vs Fiberglass Insulation**

https://www.fixr.com/comparisons/cellulose-vs-fiberglass-insulation

- **Window Replacement or Installation Cost**

https://www.fixr.com/costs/window-replacement

- **Weatherstripping Cost**

https://www.fixr.com/costs/weatherstripping

Lighting and Daylighting

- **Recessed Lighting Installation Cost**

https://www.fixr.com/costs/recessed-lighting-installation

- **Kitchen Remodeling Cost**

https://www.fixr.com/costs/kitchen-remodeling

- **Skylight Installation Cost**

https://www.fixr.com/costs/skylight-installation

- **Skylights vs Solar Tubes**

https://www.fixr.com/comparisons/skylights-vs-solar-tubes

Helpful Resources

- **Window Shades Cost**

https://www.fixr.com/costs/window-shades

- **Window Blinds Cost**

https://www.fixr.com/costs/window-blinds

- **Blinds vs Shades**

https://www.fixr.com/comparisons/blinds-vs-shades

Space Heating and Cooling

- **Heat Pump Cost**

https://www.fixr.com/costs/heat-pump-installation

- **Geothermal Heating Installation Cost**

https://www.fixr.com/costs/geothermal-heat-installation

- **Ductless Air Conditioner Cost**

https://www.fixr.com/costs/ductless-air-conditioner-installation

- **Furnace Installation Cost**

https://www.fixr.com/costs/furnace

- **Annual Air Conditioner Maintenance Cost**

https://www.fixr.com/costs/annual-air-conditioner-maintenance

Helpful Resources

Water Heating

- **Water Heater Installation Cost**

https://www.fixr.com/costs/install-water-heater

- **Tankless Water Heater Installation Cost**

https://www.fixr.com/costs/install-water-heater

Renewable Energy and Generation

- **Solar Panel Installation Cost**

https://www.fixr.com/costs/solar-panel-installation

- **Geothermal Heating Installation Cost**

https://www.fixr.com/costs/geothermal-heat-installation

Remodeling Terms Cheat Sheet

- **Air Sealing**

Air sealing is the process of finding and sealing up any areas in the home where air leakage and, therefore, energy leakage may occur. These may be located anywhere in the home from the attic to the basement.

- **Blown-in Cellulose**

Cellulose or paper insulation that is blown into wall and ceiling cavities to completely fill the space and create better insulation with pieces that must be cut.

Helpful Resources

• **Building Envelope**
The exterior of the home, which separates the conditioned and unconditioned sections of the building. This barrier is meant to repel noise, moisture, air, heat, and light.

• **Energy Star Rated Appliances**
Appliances that have been certified by a government-backed labeling program designed to help homeowners and businesses find the most efficient appliances in order to save money and reduce greenhouse gas emissions.

• **Energy Storage**
Batteries or another form of storage that can hold the energy produced by solar, wind, or hydropower until a later time when it is needed.

• **Exterior Rigid Polystyrene Foam**
Stiff, insulating-foam board, which is applied to the exterior of the building, beneath the facade, and is often used in creating a tight building envelope.

• **Expanding Spray Foam**
Insulating foam that is sprayed onto the interior of walls as a liquid, which expands as it makes contact to provide superior insulating properties to batts or loose insulation.

• **Fiberglass Batt Insulation**
Insulation made of fiberglass and formed into long batts that are designed to fit between the studs of the walls or in the attic. It is available in many thicknesses with several R-values.

• **Flow Fixtures**
Flow fixtures, or low-flow fixtures, are water appliances that restrict the number of gallons per minute of water that they produce. Examples include faucets, shower heads, and toilets.

Helpful Resources

• **Heat Pump**
A device used to heat or cool the air in a home by moving hot and cold air to where it is needed. The unit pulls hot air from inside the home in the summer and directs it outdoors, leaving the cool air inside, and pulls heat from outdoors in the winter and directs it into the home, thereby warming it.

• **Heat Recovery Ventilator**
An energy recovery ventilation system, which uses the heat in outgoing, stale air to warm up fresh air as it comes into the building. This allows fresh air to circulate while making the most use of the current internal temperatures.

• **HVAC**
An acronym for Heating, Ventilating, and Air Conditioning, the standard system that controls the temperature and quality of air in buildings.

• **Hybrid Heat Pump Water Heater**
A method of heating the home and hot water used by a home at the same time, using the same appliance.

• **ICFs**
Insulated concrete forms, or foam building forms, which are filled with concrete for structural integrity. They produce a home or building that is soundproof, as well as very energy-efficient with a tight building envelope.

• **Phase Change Materials**
A substance that has a high heat of fusion. When they are melted and solidified at certain temperatures, they can store and release large amounts of thermal energy.

• **Radiant Barrier**
A building product that reflects thermal radiation and reduces thermal or heat transfer.

Helpful Resources

• **SIPs**
Structural Insulated Panels. High-performance exterior building panels made of insulating foam sandwiched between two structural facings.

• **Staggered Double-Stud Exterior Wall**
A double wall consisting of a wide internal cavity for the purpose of filling it with additional insulation. This is designed to give a better, more energy-efficient exterior to a home.

• **Solar Photovoltaic Panels**
Panels that are installed on the roof of a home or building for the purpose of harnessing the sun's energy to offset the energy used by the home or building from traditional means. These are often called solar panels.

• **Solar Photovoltaic Shingles**
Individual roofing shingles that work like miniature solar panels to harness the sun's energy and use it to power the home or building or to offset the amount of energy used from traditional sources.

• **Thermal Mass Storage**
The ability to absorb and store solar energy over the course of a day. For example, in passive homes, thermal mass storage means that little additional energy is needed to warm the space.

• **Tight Building Envelope**
A building envelope that has been completely sealed against air transfer and thermal transfer to create a more efficient home.

• **Weatherstripping**
Strips of material, which are used to seal the air gap around doors, windows, and casing.

Energy-Efficient Home Design Trends

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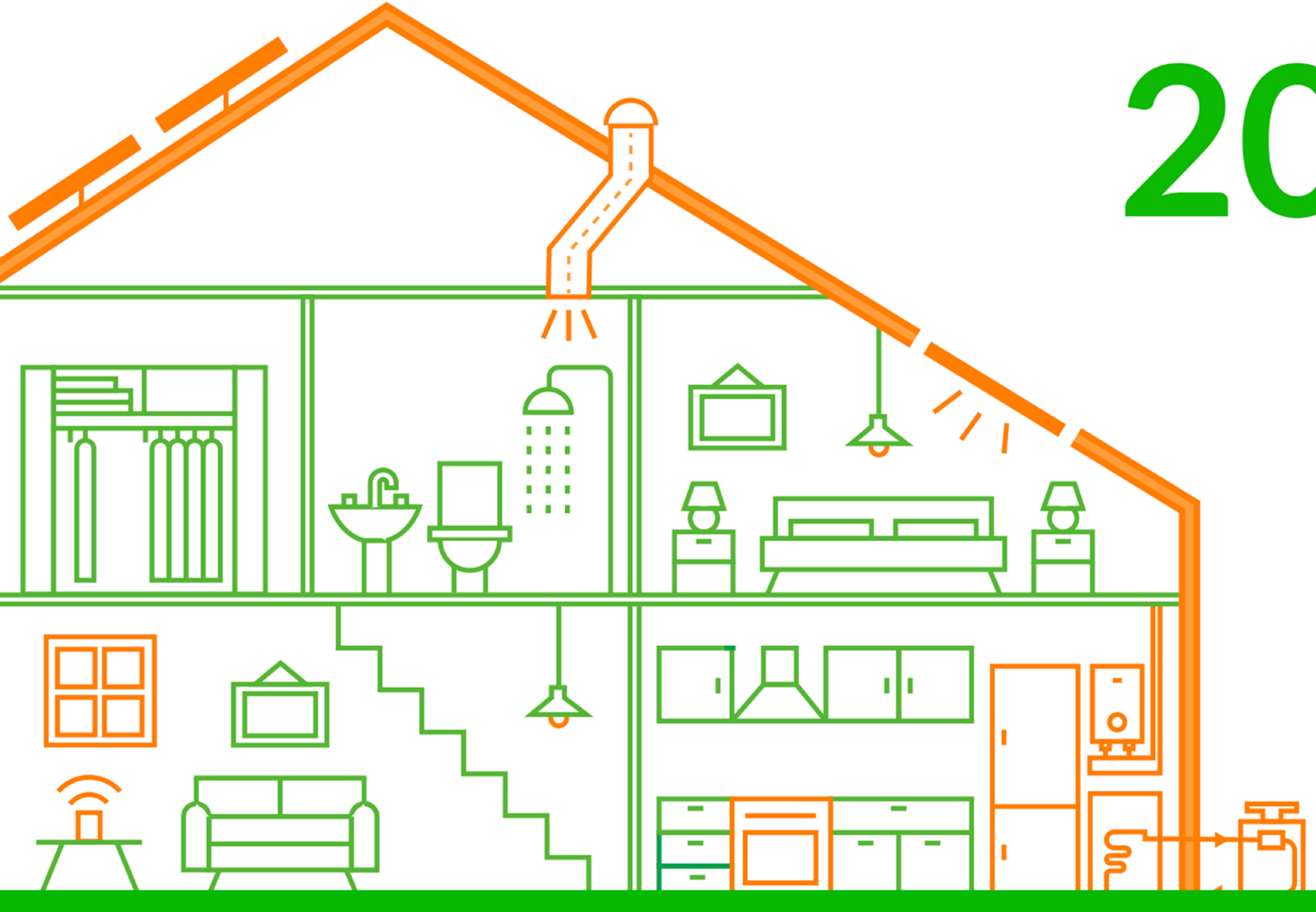

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