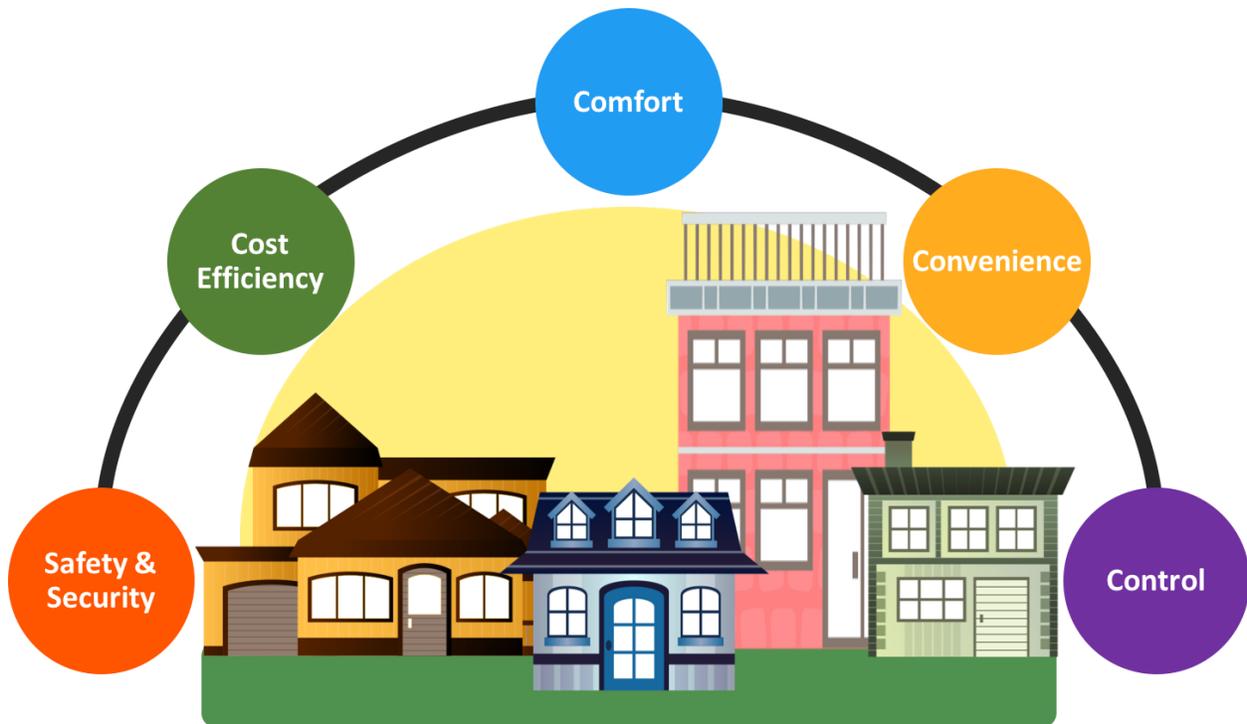


# CONSUMER GUIDE TO AGING IN PLACE: SMART TECHNOLOGY & SERVICES



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# INTRODUCTION

The idea of “aging in place” implies living independently at home or in residential communities and maintaining autonomy and self-determination. Living independently includes considering the goals and needs of those residing in the home and creating an environment that enhances independent living. There are five key home conditions (see table below) that can promote aging in place. Establishing these conditions and using Smart Technology and home energy efficiency strategies, provides greater opportunity for people to live and age in place and minimize or eliminate barriers within the home.

Key Home Conditions	
	<b>SAFETY &amp; SECURITY</b> – physical safety and home security
	<b>COMFORT</b> – temperature control and air quality
	<b>CONTROL</b> – self-confidence and ability
	<b>CONVENIENCE</b> – ease of use and accessibility
	<b>COST EFFICIENCY</b> – cost savings over time

The guide includes:

- A description of key home conditions related to the challenges of successful aging in place;
- A description of available Smart Technology and services that can meet these challenges;
- Guidance on selecting, purchasing and installing Smart Technology, and in initiating related services;
- A listing of Smart Technology currently available on the market.

In addition, the guide provides brief situational examples that illustrate the value of these technologies and services to those aging independently in their homes. A glossary of terms used in the Smart Technology and service marketplace is also included. We also provide examples of currently available Smart Technology.

The development of this guide was supported by the Illinois Science & Energy Innovation Foundation (ISEIF). Consequently, the guide focuses on Illinois residents although its content is more broadly applicable to residents residing outside of the state as well.

# KEY HOME CONDITIONS FOR AGING IN PLACE

Aging and housing researchers have identified several challenges that residents encounter when they choose to age in place. Most of these relate to maintaining the safety and security, comfort, convenience, control and cost efficiency of their homes. Ensuring the maintenance of each of these home conditions is the key for aging well in place.



## SAFETY & SECURITY

Accidental falls are the leading cause of injury-related deaths in the United States among adults over 65. One in three older adults is likely to fall at least once a year. Beyond certain health conditions and medications that impair balance, the principle cause of most falls is environmental. Besides trip hazards, such as loose rugs, extension cords, and slippery surfaces, the top environmental condition contributing to falls is insufficient lighting and access to light switches.

Personal security also rates very highly among the concerns of many older adults who choose to age in place, particularly for those aging at home alone. Older women are more likely, than older men, to live alone at home and can thus benefit from security systems.



## COMFORT

Body temperature is important to an individual's level of comfort. As a person ages, the ability to maintain a satisfactory temperature is reduced. Some prescription medications and diseases can also influence body temperature and its regulation.

Indoor air quality plays a key role in producing a comfortable living environment. Older adults are increasingly vulnerable to a variety of indoor air pollutants, especially if these adults are challenged by compromised immune systems, lung disease, or asthma. Common pollutants found in the home can include mold spores, dust mites, skin cells, textile fibers, viruses, plant pollens, respirable particles

from cooking, nitrogen dioxide and carbon monoxide from natural gas, off-gassing paints, formaldehyde from pressed wood furniture and carpeting, and cleaning products. Those with respiratory challenges are particularly susceptible to these pollutants. During winter months when opportunities for fresh air exchanges are limited, these challenges tend to increase.



## CONTROL

Control of the home environment, and technologies within it, is dependent on a person's self-confidence and belief in their ability to carry out activities. Because older adults tend to have less experience with new technologies, their confidence may be low; therefore, instructional support and assistance are likely to be important.



## CONVENIENCE

Convenience is a key factor in the ability to age in place. Home technologies need to be easy to use and accessible. However, physical and cognitive limitations such as vision and hearing impairments, physical mobility limitations, and memory loss that can accompany aging and may make technology interactions challenging.



## COST EFFICIENCY

Today, many older adults choosing to age in place are confronted with the dual challenges of doing so on fixed incomes while under the pressure of annual increases in the cost of living. These challenges are compounded by periodic home maintenance expenses, rising property taxes, increasing cost of prescription drugs, healthcare insurance, and medical services. Considered together, they constitute a very significant set of financial challenges for many older adults.

# SMART TECHNOLOGY & SERVICES

This guide will help consumers choose technologies to create safe and secure, comfortable, convenient, controlled and cost-effective homes. Smart Technology and services are desired by some consumers but viewed skeptically by others. This guide is designed with **ALL** consumers in mind – from the “tech-savvy” to first-time users.

Smart Technology uses computer and telecommunication technologies and the internet to track energy consumption and air quality, and to control the cost-effective and convenient operation of space conditioning, water supply, lighting, security, entertainment systems, appliances, and almost any other device that can be plugged into an outlet. Services related to making your home smart are provided through the aid of Smart Technology and the smart grid described below. For an overview of specific types of Smart Technology currently on the market, refer to Appendices B, C, D and E at the end of this guide.

## The Smart Grid

Ameren Illinois and ComEd have nearly completed their modernization of the electricity delivery system that powers most of the state of Illinois' homes and businesses. The modern system uses computers, automation, and control technologies to establish a two-way digital communication system between the electricity utility and its consumers. Every hour, the system sends the utility the energy consumption data for each consumer, which allows them to bill their consumers for the variable cost of energy during their actual hours of use. Hourly energy costs are always higher during weekday/peak demand hours and higher still when weather extremes drive up consumer demand to heat or cool homes and businesses. During the evening hours and on weekends, consumer demand decreases and energy costs are the lowest.

The modernized electricity system allows consumers to save money on their monthly energy bills by choosing to shift the operation of energy consuming appliances such as washers, dryers, and dishwashers, to the lower cost evening or weekend hours. In addition to consumer cost savings, the system also allows a utility to quickly find and fix power outages and to regulate the flow of energy among users, which increases the reliability of the entire electricity delivery grid. This ensures that all consumers have the energy they need when they need it.

## Utility Smart Grid Technology



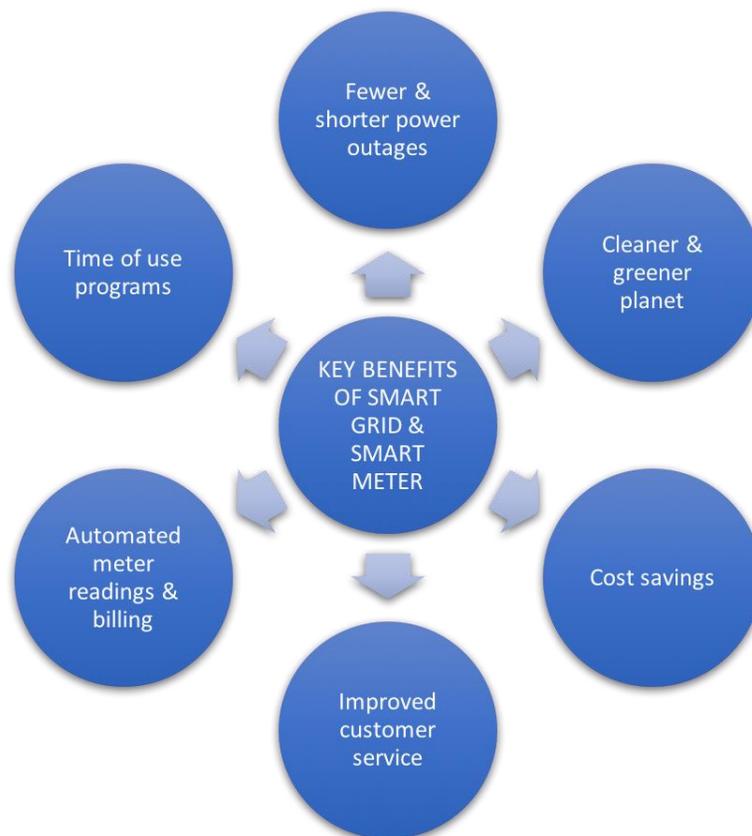
**Residential Smart Meters** - A residential smart meter is the consumer-end of the smart grid and the technology that tracks and transmits hourly energy consumption information to the utility. The automated transmission of this information to the utility eliminates the need for them to send someone out to manually read the meter, and it allows the consumer to participate in real-time pricing programs to save on monthly energy bills. The smart meter can be connected to technologies such as In-Home Displays (IHDs) that show real-time energy consumption and cost information on a counter-top or hand-held mobile unit as shown in the adjacent picture.

To learn more, find a video here:  
[https://www.smartgrid.gov/the\\_smart\\_grid/smart\\_grid.html](https://www.smartgrid.gov/the_smart_grid/smart_grid.html)

**Important Note About Privacy** - Smart meters do track energy consumption in the home; therefore, consumers might be concerned about the privacy and security of this information. Although smart meters collect and transmit this information to the utility, they do not send the customer's name, address, or social security number. The transmitted data are used primarily for the purposes of utility billing, trouble-shooting, and resolving service delivery problems. Anonymized data organized by zip code is also used for research however, it cannot be associated with a specific customer account. Both Ameren Illinois and ComEd employ extensive cybersecurity measures to secure and protect the data. Should privacy remain a concern, consumers are encouraged to contact their utility provider for further assurance that their energy consumption information is secure.

Ameren Privacy Policy:  
<https://www2.ameren.com/common/privacypolicy.aspx>

ComEd Privacy Policy:  
<https://www.comed.com/SiteCollectionDocuments/SmartEnergy/SmartGridAndPrivacy.pdf>





## Safety & Security

Technologies to support personal safety and security for older adults can allow for independence in aging in place. Concerns of older adults include falls, medical emergencies, and predators who target them. Personal safety and security technologies such as smart occupancy sensors, cameras, smoke and carbon monoxide detectors, and doorbells/entrance monitors are described below along with examples of how peace of mind and safety can be improved through use of these technologies.

Adequate interior lighting helps to illuminate household spaces and, in turn, reduces the risk of falls and injuries. Smart lighting and controls, such as smart dimmers, are described along with an example of how interior illumination can improve personal safety during routine chores.



### Smart Cameras & Monitors

Smart wireless security cameras allow a resident to monitor interior or exterior space remotely through a smartphone or tablet. Many of these monitoring systems have the capability to record video continuously or for set periods of time, or only when motion is detected. Some have audio communication capabilities that allow

a resident to listen to the camera's environment and talk to anyone inside or outside of the home. Night vision allows viewing of interior and exterior spaces in complete darkness. Many cameras self-adjust to existing lighting conditions to deliver excellent picture quality even in the glare of bright sunlight. The camera mounts allow units to tilt and pan or remain in a fixed position. Most allow the user to zoom in and out to see close details or a wide area.

### **How a Smart Camera Benefits Richard and Sandy**

Richard and Sandy live in a 2-story townhouse and they enjoy the community feel of nearby neighbors. When they travel, Richard and Sandy alert neighbors of their extended absences. While Richard and Sandy appreciate knowing that neighbors are keeping an extra eye on their place, they desired greater peace of mind during times of travel. They want security while they are away on a day-to-day basis for a short time and while they are at home by themselves. To obtain that additional security, Richard and Sandy installed a smart camera system and an occupancy sensor to monitor any movement within and outside of their home.

### **Smart Dimmers**

Smart dimmer switches enable residents to dim and control interior lighting remotely through voice commands and mobile software applications. These applications also allow the resident to schedule the operation of lighting based on established daily routines.



## How Smart Lighting Benefits Marie

When entering her home from the attached garage, Marie must navigate two steps into the entry hallway of her house. There are no handrails and, often, she is carrying items in her hands. A smart lighting hands-free motion sensor allows the hallway to become illuminated when Marie enters and depart. This enables her to safely navigate the steps and this home area as she goes about daily chores.

## Smart Door Bells

Smart doorbell/entrance monitor systems allow residents to monitor and to record visitors from remote location via smartphones, tablets, and computers. Motion detection sensors, alarms, and two-way audio features are available on many of these technologies.



## Smart Door Locks



Opening up one's home to visiting family members and friends is a means of staying connected. Smart locks can be used to automatically or remotely lock doors. This allows home occupants to share virtual keys with guests. Smart monitors and locks give individuals the ability to unlock and monitor their doors from

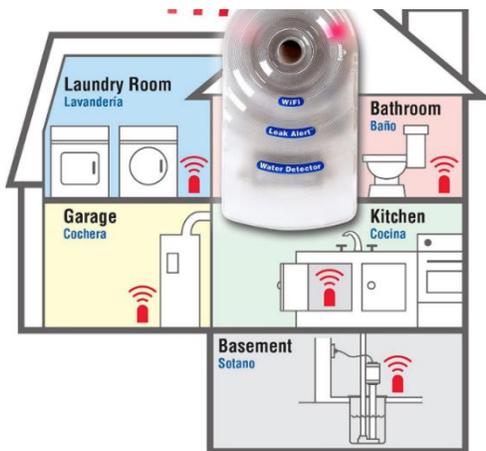
remote locations and, if desired, grant people access without having to give them physical copies of their house keys. A phone, keypad, or a traditional key can also be used to unlock the door. Smart door locks can be used remotely via Wi-Fi with a hub and door sensor. A hub is a central control

technology that allows different technologies to work together and to be operated remotely by voice or smartphone signal.

### How Smart Door Locks Benefit Mike's Control

Mike values family connectedness and frequently hosts his relatives as guests in his home although he lives in a different state than most of his extended family members. To avoid the hassles of having keys made, hiding keys near the doorway, or having his relatives remember to bring a key, Mike has a smart monitor and locking system that enables him to remotely lock/unlock the doors for his guests. As an added control feature, Mike can remotely receive notifications about the opening or closing of doors and windows at his home.

### Smart Leak Detectors



Smart Wi-Fi connected leak detectors can send alerts when even the slightest amount of moisture is detected and direct a resident to the source of the leak. These technologies continuously monitor potential leaks around sinks, dishwashers, appliances, refrigerators, washing machines, sump pumps, water heaters, hot tubs, water filtration units, and more.

## Smart Lighting & Dimmer Controls

Enhanced lighting assists all who live in the home and is especially beneficial for those with vision impairment or hearing loss. Smart lighting systems can be programmed to support the needs of individuals, such as cues when appliances have completed cycles or visitors arrive at the door. Smart lighting is also designed to increase energy efficiency by adapting light intensity according to various parameters (natural light, occupancy, etc.).

### How Smart Lighting Benefits Marie

When entering her home from the attached garage, Marie must navigate two steps into the entry hallway of her house. There are no handrails and, often, she is carrying items in her hands. A smart lighting hands-free motion sensor allows the hallway to become illuminated when Marie enters and depart. This enables her to safely navigate the steps and this home area as she goes about daily chores.

## Smart Occupancy Sensors

Ceiling mounted occupancy sensors use technology to automatically turn lights on when motion is detected.



## Smart Smoke & Carbon Monoxide Detectors

Smart smoke alarms and carbon monoxide detectors have built-in sensors and can be monitored and silenced from a smartphone. Technologies can be tested remotely or programmed to perform automatically scheduled tests. Information describing a problem can be relayed to a smartphone.



## Wireless LED Interior Lighting



Use of Wi-Fi enabled LED lights enable a resident to remotely operate lighting from a smartphone. In addition, many of these lighting systems include smart sensors that automatically illuminate at night and turn off during the day. Some devices activate only when an interior space is occupied.



## Comfort

Temperature control and air quality in the home are two main physical comfort considerations when equipping the home with air conditioning and air quality technologies. Below, smart thermostats and smart air sensors/purifiers are described along with examples of how these technologies improve comfort for people aging in place.

### Smart Air Quality Sensors/Smart Air Purifiers



Optimum air quality provides comfort in breathing in fresh air in the home. Products such as air purifiers can provide air quality readings and make the home a more comfortable and a healthier environment, which improves quality of living conditions. Wi-Fi enabled purifiers provide the power to monitor and control air quality from any location inside or outside of the home. An air cleaning system provides allergy relief, reduces odors, automatically monitors indoor air quality and makes needed adjustments. These systems have advanced filters that remove allergens, pet dander, and dust while also generating a soothing noise that gently masks disruptive sounds for a peaceful night's sleep.

#### How a Smart Air Quality Sensor/Smart Air Purifier Benefits Lynne & Her Mom

Lynne provides care as needed and is a regular companion for her widowed mother, Jeanette, who has a chronic respiratory disease and severe seasonal allergies. Lynne works full-time during the day and worries about her mother's well-being, particularly the air quality in her mother's home. Lynne and her mother Jeanette discussed their shared concerns and agreed that adding an air purifier system for air quality control and air monitoring would offer greater comfort and well-being.

## Smart Thermostats

Smart thermostats address the challenge of maintaining heating, ventilation, and air-conditioning levels by utilizing temperature/climate sensors and controls to keep interior spaces at the preferred and safe settings without relying on the intervention of the home's occupant. Automated space conditioning with a smart thermostat connected to mobile technologies allows for remote control of the space conditioning system from any location.

In this way, smart thermostats deliver enhanced safety, comfort, convenience, and energy bill cost savings.



Smart thermostats can include:

- Occupancy detection to indicate if someone is home;
- “Learning” residents preferred temperature patterns;
- Heat pump lockout temperature control to monitor outdoor temperature and to turn on heat when a set temperature is reached;
- Temperature regulation based on desired temperature versus actual temperature.
- Optimal humidity control even without a dehumidifier via a process known as 'AC overcooling';
- Fan operation over a cold coil or heat exchanger after a heating or cooling cycle to further optimize cooling or dehumidification;
- Free cooling/economizer capabilities to use cool outdoor air as a chiller source for air conditioning units.

### **How a Smart Thermostat Benefits Sue's Physical Comfort**

With rising costs of living, Sue sought ways to save money on cooling and heating utility bills and still be comfortable in her home. During the summer months, Sue prefers cooler temperatures at night when she sleeps and warmer temperatures during the day when she is away. Sue got a smart thermostat that was able to learn her preferences and adjust the temperatures to suit her. Sue can remotely monitor and/or adjust programming from her smartphone. Sue is able to save money on her monthly utility bills with a set temperature regulation system. She has the ability to adjust her thermostat remotely on her smartphone, as needed, when she is not home.





# Control

The ability to monitor and operate multiple Smart Technology devices from one device is a simple way of maintaining control of your entire home. This chapter describes three devices that enable you to achieve that control.

## Digital Home Assistants



A digital home assistant is a hands-free, voice-controlled technology that can control Smart Technology devices, make calls, send and receive messages, provide information, read the news aloud, play music, set musical alarms, read audiobooks aloud, control the television, and more. Some have a video screen to display information.

A digital home assistant can serve as a smart hub.

### How a Digital Home Assistant Benefits Marlene

At age 80, Marlene lives independently in her own home. However, as her mobility has changed in recent years, she needs to be able to control the lights, temperature, and door locks from her wheelchair. A digital home assistant can serve as a hub that links her Smart Technology devices together. This enables her to control them through voice activation. As an added benefit, her digital home assistant allows her to connect with family and friends, and control entertainment systems in the home.

## In-Home Displays

In-Home Displays can provide information on weather conditions, real-time energy consumption and costs, and can enable a user to control Smart Hub connected devices in the home. Several In-Home Displays can also store and automatically scroll through family photos and any other pictures of interest to the user.



## Smart Hubs

A Smart Hub is a central control technology that connects all Smart Technology in the home and allows communication among technologies. For example, residents can use a hub to remotely control electricity outlets, thermostats, lighting, entertainment, and security through voice activation or smartphone apps. Several applications are available to allow social connection between family members and friends as well as opportunities to make new friends. These technologies can provide easy access to a range of social networking platforms.





## Convenience

Technologies that support functionality, ease of use, accessibility, and connectivity help to maintain and/or improve the ability to independently age in place. Smart appliances, programming and plugs are described along with an example of how independence and autonomy for ease of use and accessibility can be supported using Smart Technology.

### Smart Appliances



Appliances such as smart refrigerators can help track grocery purchases and facilitate re-ordering directly from a control panel located on the door. Door-mounted screens allow the resident to adjust the temperatures in their refrigerator, view interior and exterior camera images, and view the inside of the refrigerator from a smartphone to see what is needed while at the grocery store.

Other smart appliances, such as washers, dryers, dishwashers, ovens, and ranges can also be programmed, remotely controlled, and set to operate at night or on weekends to take advantage of lower electricity pricing.

### ***How a Smart Refrigerator Benefits John & Caroline***

John and Caroline provide daily extended care of their grandchildren during the work week for their adult daughter, Kathy. Their smart refrigerator makes grocery shopping easier with the ability to monitor contents and store a running grocery list. John and Caroline review the stored grocery list and order their groceries every Sunday to prepare for the week with their grandchildren.



## Smart Plugs

Smart Plugs connect Smart Technologies (e.g., lights, fans, and air purifiers) and allow a resident to control them remotely from any location using a smartphone or tablet.

## Smart Programming

Residents with smart thermostats and other technologies that can respond to utility price alerts can use a simple way to automate their operation using a small application or “applet” known as If-This-Then-That (IFTTT). The applet allows a resident to create “scripts” or simple “recipes” that instruct one technology on how to operate when it receives a signal from another technology.

ComEd provides this example: ***IF*** Hourly Pricing Average Price is High, ***THEN*** Send a Signal to Your Phone.

In this example, if the average price for customers enrolled in the utility’s hourly pricing program is over a set price, their IFTTT applet will send them a voice or text message announcing that the price has exceeded their preference. With that notice, they can then manage their energy use to save money on their electric bill.

ComEd customers can learn more about that utility’s program supporting this application at the following website page:

<https://www.comed.com/WaysToSave/ForYourHome/Pages/IFTTTEnergySavings.aspx>





## Cost Efficiency

Residents who elect to age in place are often on fixed incomes and subject to the rising cost of living and the increasing cost of healthcare and medical services. Consequently, it is important that all opportunities to achieve household cost savings are explored. Fortunately, the smart grid, smart meters, and Smart Technology provides residents many opportunities to reduce their monthly cost of living while increasing their safety and security, comfort, convenience, and control. The utility programs made possible by these new technologies are described below and links and contact information are provided for those interested in pursuing these cost saving opportunities.



Ameren Illinois and ComEd, the largest electricity utilities in Illinois, operate a number of programs that provide their customers opportunities to manage their energy consumption and to reduce their monthly energy bills. These include:



- \* Real-Time or Hourly Pricing Programs
- \* Peak Time Savings or Rewards Programs
- \* Connected Device or Home Area Network Programs
- \* Online Customer Accounts
- \* Traditional Energy Efficiency Programs

## **Real-Time or Hourly Pricing Programs**

These programs allow residents to purchase electricity at prices that vary by the hour based on the wholesale market price for electricity at each hour. Electricity prices are highest during peak hours of demand which are roughly from 10 a.m. to 9 p.m. during weekdays. Electricity prices then drop with demand at night and on weekends and are the lowest between the hours of 9 p.m. and 10 a.m. Customers who switch from fixed-rate pricing and enroll in these variable rate programs can save as much as 15% on their monthly electricity bills by operating major appliances such as washers, dryers, and dishwashers during off-peak hours when hourly prices are the lowest.

Customers enrolled in these programs also receive pricing alerts that notify them when hourly prices are expected to be higher than usual due to predicted excessive weather events.



**Important Note:** Although these programs provide a resident that is aging in place real opportunities to save, they are not recommended for individuals who are dependent on the continuous operation of electronic medical technologies. Peak time usage of these technologies would cost more than a fixed-rate pricing program for continuous use.

## **Peak Time Savings or Rewards Programs**

These programs allow enrolled residents to receive a credit on their energy bill for voluntarily reducing electricity usage during certain peak hours during the summer when energy consumption is predicted to be exceptionally high. These particular time periods or “Events” typically fall between 9 a.m. and 5 p.m. between the months of June and September when air conditioning is in high demand.

Enrolled customers are notified the day before a predicted event by phone, email, or text (their choice). If they reduce their energy usage below their previously recorded usage during a similar period on a non-event day (the baseline), they will receive a credit. These credits are calculated at a certain dollar amount per kilowatt hour of energy reduced from the baseline for that time period.

### **How Peak Time Savings Helps Karen to Reduce Her Energy Bill**

Karen enrolled in in the Peak Time Savings Program. There was a long stretch of hot and humid days during the month of July. She was notified via text message that the next day between 9 a.m. and 5 p.m. energy consumption was predicted to be exceptionally high. Karen opted to reduce her electricity usage during this peak time and complete her laundry cycle during the evening hours to receive a credit on her energy bill.

### **Connected Device or Home Area Network Programs**

These programs are designed to enable residents to wirelessly connect certain Smart Technology to the utility smart meter and to use those technologies to access detailed electricity consumption and pricing information to perform their function. At the present time, most of the technologies that are equipped with the wireless communication protocol, or language that allows them to communicate with the smart meter, are In-Home Displays, gateways (a technology that collects data from a smart meter and sends it to a display), smart thermostats and range extenders that allow wireless devices to operate beyond the 50' distance limit from the smart meter.

Both Ameren Illinois and ComEd operate a connected device service and maintain a list of Smart Technology that is compatible with their smart meters on their websites (See Appendix F). This list should be consulted before purchasing a product that is designed to use smart meter data.

## Online Customer Accounts

Ameren Illinois and ComED also offer residents private online accounts where they can:

- Track their hourly, daily, and monthly energy consumption;
- Establish a home energy profile and customize an energy efficiency plan;
- Set-up phone, text, and email alerts of price changes and weather events;
- Investigate a variety of energy efficiency strategies and tools; and
- Enroll in the programs described above.

## Traditional Energy Efficiency Programs

In addition to smart meters, Smart Technology programs, and online accounts, Ameren Illinois and ComEd offer a variety of traditional energy efficiency programs that can save residents money. These include: home energy assessments, energy efficient product rebates and discounts, free used appliance pick-up and recycling services, free weatherization services, and income-eligible programs offering no-cost energy efficient products and installation services.

To learn more about the services described in this chapter, refer to Appendix F.



**Important Note:** It is important to remember that the adoption of Smart Technology is not meant to threaten or jeopardize the control over your environment but rather allow tasks to be automated and accomplished through these technologies. The purchase decision can be overwhelming, and it certainly is not necessary to adopt all technologies. The next chapter will help guide you through the decision process to determine which technologies are the best fit for the specific needs in your home.



# TECHNOLOGY SELECTION, PURCHASE & INSTALLATION

## Tips on how to be a savvy consumer

Shopping for Smart Technology can be overwhelming and mistakes can be very costly; therefore, it is necessary to be a savvy consumer. This chapter is designed to serve as a guide to: assess your technology needs; investigate technologies currently on the market; determine which features best meet your needs; purchase the technologies; and arrange for their installation in your home.

### Step 1: Assessing Your Smart Technology Needs

The first step in the process is to determine your short- and long-term needs regarding aging in place, as well as those of other members of your household. Consider conducting a room-by-room approach to identify the challenges that you and other members of your household may face as you age in place. The following questions will help you think through those challenges:

1. What challenges or limitations do you or members of your household anticipate experiencing in the next 2-5 years, 6-10 years, and beyond?
2. What Smart Technologies would help you meet those challenges and what specific functions and features would be most desirable?  
(*Examples:* reduction in indoor air pollutants, maintaining a consistent temperature)
3. What would be the most ideal way to control those technologies and what other devices might be needed to accomplish that task?
4. What budget do you currently have for devices that will meet these challenges and what additional resources will be necessary and when?

## **Step 2: Investigating, Selecting & Purchasing Smart Technologies**

Appendices B, C, D and E of this guide list the available Smart Technology devices that can help a resident meet the challenges identified in the previous step. Prior to reviewing the lists, the following key questions should be considered relative to selection and purchase.

1. Will the technologies meet my needs and the needs of others in the household?
2. Once installed, will the technologies be easy to operate?
3. What are the additional costs of home adaptations/modifications, if any, related to the technology?
  - Installation
  - Batteries
  - Other Smart Technology necessary to operate the system
4. Will this technology be compatible with other Smart Technology?
5. As my needs and the needs of the household change, will additional technologies work with the main communication hub?
6. Are product rebates available?
7. Has the technology earned favorable reviews and ratings?
8. Is the technology aesthetically appealing and does it fit with my current home décor?
9. What is the projected life expectancy of the technology? What is the warranty?
10. Is the price within my budget? Is this a one-time cost or will there be future costs to maintain and/or upgrade?

### **Step 3: Locating a Certified Smart Technology Installer**

Once you have identified a needed or desired Smart Technology and a specific device for your home, you'll need to find a qualified installer. In addition to placing the device in your home, the installer will work with you to activate it and to guide you through its maintenance and use.

To ensure that your installer has experience working with older adults aging in place, it is recommended that he/she be trained as a senior specialist. The **Illinois Smart Technology Assisting Residents** (I-STAR) training program provides that senior specialist training and ensures that those that complete it understand the specific needs and preferences of older adult residents. Participants that pass the program's final exam are known as *Certified I-STAR Installers*. You can locate one of these installers on the program website at [www.I-STAR.org](http://www.I-STAR.org)

Once you have located a certified I-STAR installer, the questions below will assist you in interviewing the individual to make sure he/she is familiar with the device you have selected.

1. What type(s) of Smart Technology do you install?
2. What is your experience installing these types of technologies?
3. Can you provide references of your recent work?
4. What is the cost of installation?
5. What guarantees and/or warranties are offered on the installation?
6. What follow-up technical assistance do you provide?
7. Will you teach me to use the technology?
8. Have you completed the Certified I-STAR Installer training program?



**Illinois  
Smart  
Technology  
Assisting  
Residents**

**I-STAR**

Please refer to [I-STAR.org](http://I-STAR.org) to find a professional near you.

# SUMMARY

This guide has introduced five key home conditions that promote healthy aging in place. Smart Technology is available today that can help a resident accomplish this goal by enhancing their safety and security, comfort, convenience, control and cost efficiency. The guide has also described the specific Smart Technologies that are currently on the market and some important considerations to keep in mind when selecting, purchasing and arranging for their installation in your home.

The remainder of this guide contains a glossary of Smart Technology terms, a list of the available devices, and information on utility Smart energy services available to most Illinois residents. This additional content is provided in the following appendices.

- Appendix A: Glossary of Terms Related to Smart Technology
- Appendix B: Smart **Safety & Security** Technology
- Appendix C: Smart **Comfort** Technology
- Appendix D: Smart **Control** Technology
- Appendix E: Smart **Convenience** Technology
- Appendix F: **Cost Efficiency** Services

# RESOURCES

## Websites

### Ameren Illinois: Smart Grid Information

A Smart Grid Will Outsmart Outrages:

<https://www.ameren.com/illinois/company/reliability/grid-of-the-future#sts=Smart%20Grid>

Information and Frequently Asked Questions Regarding Advanced Meters:

<https://www.ameren.com/illinois/company/reliability/grid-of-the-future#sts=Smart%20Grid>

Ameren's Home Area Network

<https://www.ameren.com/illinois/account/customer-service/smart-meters/home-area-network>

### ComEd: Smart Grid Information

Smart Grid Fact Sheet:

[https://www.comed.com/SiteCollectionDocuments/SmartEnergy/EIM\\_A\\_FactSheet\\_SmartGrid.pdf](https://www.comed.com/SiteCollectionDocuments/SmartEnergy/EIM_A_FactSheet_SmartGrid.pdf)

Smart Grid Resource Center:

<https://www.comed.com/SmartEnergy/SmartMeterSmartGrid/Pages/ResourceCenter.aspx>

The Benefits of the Smart Grid:

<https://www.comed.com/SmartEnergy/SmartMeterSmartGrid/Pages/SmartGrid.aspx>

ComEd's Smart Grid Brochure:

[https://www.comed.com/SiteCollectionDocuments/SmartEnergy/EIM\\_A\\_SmartGrid\\_Brochure.pdf](https://www.comed.com/SiteCollectionDocuments/SmartEnergy/EIM_A_SmartGrid_Brochure.pdf)

DataGuard Energy Data Privacy Program:  
[https://www.smartgrid.gov/data\\_guard.html](https://www.smartgrid.gov/data_guard.html)

Illinois-Smart Technology Assisting Residence (I-STAR):  
[I-STAR.org](http://I-STAR.org)

Information on the Smart Grid  
<https://www.smartgrid.gov/>

What is the Smart Grid?:  
[https://www.smartgrid.gov/the\\_smart\\_grid/smart\\_grid.html](https://www.smartgrid.gov/the_smart_grid/smart_grid.html)

## Research Articles

Ahn, M., Beamish, J. O., & Goss, R. C. (2008). Understanding older adults' attitudes and adoption of residential technologies. *Family and Consumer Sciences Research Journal*, 36(3), 243-260.

Balta Ozkan, N., Davidson, R., Bicket, M., & Whitmarsh, L. (2013). Social barriers to the adoption of smart homes. *Energy Policy*, 63, 363-374.

Fisk, A. D., Rogers, W. A., Charness, N., Czaja, S. J., & Sharit, J. (2009). *Designing for older adults: Principles and creative human factors approaches* (2nd ed.). Boca Raton, FL: CRC Press.

Kim, K. I., Gollamudi, S. S., & Steinhubl, S. (2017). Digital technology to enable aging in place. *Experimental Gerontology*, 88, 25-31.

Peek, S. T., Wouters, E. J., van Hoof, J., Luijkx, K. G., Boeije, H. R., & Vrijhoef, H. J. (2014). Factors influencing acceptance of technology for aging in place: A systematic review. *International Journal of Medical Informatics*, 83(4), 235-248.

# FUNDING AGENCY & AUTHORS

For more information, visit: <https://I-STAR.org/about>

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- The Department of Human Services and Community Leadership at Eastern Illinois University
- The Collaborations in Health, Aging, Research, and Technology (CHART) Program in the College of Applied Health Sciences at the University of Illinois Urbana-Champaign
- The Indoor Climate Research & Training Group in the Illinois Applied Research Institute at the University of Illinois Urbana-Champaign
- The Seniors Independent Living Collaborative

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The development of this guide benefited from the contributions of Paul Francisco, Andrea Carlson, Stacy Gloss, Lori Shupe, and the older adults who helped to test it for clarity and comprehensibility.

## APPENDIX A: GLOSSARY

### Information compiled from:

- The National Association of Realtors:  
<https://crtlabs.org/smart-home-glossary/>
- Home Automation Glossary:  
<https://www.vesternet.com/resources/glossary>
- Smart Grid Today:  
<https://www.smartgridtoday.com/public/Glossary-2.cfm>  
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  - To view the full glossary on Smart Grid Today's website, please visit: <https://www.smartgridtoday.com/public/glossary.cfm>

**Actuator:** A device that is triggered by a sensor.

**AirPlay:** The wireless protocol used by Apple to allow for audio and video streaming over a wireless network between compatible technologies.

**Application (APP):** A term used to describe an application that runs on mobile technologies such as personal smartphones and tablet computers.

**Automated or Advanced Metering Infrastructure (AMI):** A utility infrastructure with two-way communications for metering and associated systems allowing delivery of a wide variety of services and applications to the utility and customer.

**Applet:** The IFTTT Applet triggers an action or response using the IFTTT web service whenever an event occurred. (If this happens, do that) or (If this happens, do this, and then this, and then this).

**Automation:** The ability for your home or technologies to react without

input from humans. For most smart homes, this is achieved by having multiple technologies communicate with each other, including sensors, cameras, and other products, to achieve varying levels of automation.

**Bluetooth LE/ Bluetooth Smart:** A wireless protocol that is popular among smart home technologies.

**Cloud-to-Cloud:** Many smart home products use cloud services for their core functionality. Although it is not ideal having your technologies relying on an internet connection, it does sometimes allow for increased interoperability. Two technologies in the same room might not be able to communicate directly. Instead, messages are sent back and forth through their respective cloud services over the internet. This is known as “cloud to cloud” and is becoming a popular way for hardware vendors to increase compatibility.

**coMesh Network:** Protocols that are designed using a mesh network means products can pass messages from device to device in a “hopping” fashion until the final destination is reached. Every device in your home acts as a range extender; the more technologies you have, the more powerful/ reliable your network becomes.

**Device:** A specific electronic product that can be controlled through the wireless network. The device can be a local wireless controller, which controls a specific light or appliance (usually connected to it by mains wiring), or a sensor that provides input to the network. Each device is seen as a network Node.

**Digital Home Assistants:** Digital applications that use voice recognition to aid in the control of a smart home. Amazon’s Alexa, the Google Assistant, and Siri are all examples of voice assistants that are designed to control smart home technologies.

**Dimmer:** A wireless controlled device that controls the brightness, as well as the On/Off state of a local light.

**Ethernet:** Common system to create a computer network using cables

(wired network). This system is less common in homes, where the more convenient Wi-Fi (wireless) system is used. However, the wireless Router typically includes Ethernet sockets so that a PC or other device can be directly connected to it.

**Event:** A set of commands that is instigated following a trigger from a device or sensor. For instance, when a motion detector is tripped a light comes on.

**Gateway:** Connects your home automation network to the Internet. The Gateway enables you to control the network and all the technologies on it from anywhere in the world using a computer or smartphone. It also enables your network to send and retrieve information from specific remotely located servers.

**Geofence:** A virtual perimeter for the real world. Using your Wi-Fi, Bluetooth, or GPS radios, your Smart Home software can trigger events based on your physical location. For example, you can use a geofence to automatically turn off your lights when you leave for the day.

**Groups:** A collection of individual technologies, which can be controlled as a group. For instance, a controller can switch them all on with one action, rather than having to turn on each device individually.

**Home Automation:** All aspects of adding control to your home and appliances. It can be as simple as adding remote control to a few lights or creating a more complex system that includes automatic sensors and security systems.

**Hub:** The central device that allows all the different products (lights, locks, thermostats) to work together. Most hubs will also act like a universal remote, as well as providing the tools necessary to automate your technologies.

**IFTTT:** “If This, Then That” allows users to connect multiple technologies by creating “recipes” for products that may not natively speak to each other. For instance, you can have your lights flash on and off when you need to

leave work at 5 p.m. if you find yourself often late to dinner.

**Include:** The process to add a device to a wireless network. When included, the device can be controlled by the network.

**Interoperability:** The ability for different smart home technologies and services to reliably work together.

**IoT (Internet of Things):** A broad term that refers to everyday technologies such as lights, thermostats, and locks that can connect to the Internet and to each other. These connected technologies can exchange data and work together, automating tasks that used to be manually performed.

**Internet Protocol IP:** A device that can send information using a computer network or the internet. It is commonly used with security cameras.

**Load:** An electrical load is an electrical component or portion of a circuit that consumes electric power such as appliances and lights.

**Network:** Two or more technologies connected together. This enables the technologies to be controlled and to communicate with each other. The reason for home automation it is typically referred to a Wireless Network as a Network.

**Pairing (same as Include):** The process to add a device to a wireless network. When paired, the device can be controlled by the network.

**Portable Controller:** A network controller that can be moved around the home. These controllers are normally hand-held and battery-powered.

**Protocol:** The language that technologies use to send commands to one another. Examples of popular smart home protocols include X10, Bluetooth Low Energy, Z-wave, and ZigBee.

**Router:** Connects a local area network (LAN) to the Internet.

**Sensor:** Offers a wide variety of information that can tell you not only about things going on in your home, but also be used for home automation. Presence sensors can detect if people are in a certain area, detect motion indoors and outdoors, gather indoor environmental quality factors, and report this information to other technologies using IFTTT, a smart home hub, or other protocols to make devices like lights, fans, and heating, ventilation and air condition (HVAC) units run.

**Setpoint Temperature:** The temperature that the thermostat is set to. If the room's temperature is below the setpoint temperature, the thermostat will send a signal (or close a switch) to turn on the heating system.

**Smart Assistant:** The virtual person that “lives” in a hub to assist you such as Amazon’s Alexa or Apple’s Siri.

**Smart Grid:** A nickname for the utility power distribution grid enabled with computer technology and two-way digital communications networking.

**Smart Locks:** Technologies that connect to your existing door or dead-bolt locking system and are operated via a wireless signal and controllable through an interface on a smartphone, watch or tablet.

**Smart Meter:** A utility meter for electricity, natural gas or water, usually, that always includes two-way communications technology (see AMI).

**Smart Outlets** (also called ‘Smart Plugs’): An adaptor that is used for ‘non-smart’ technologies that allows them to be remotely controlled (either by voice or app).

**Virtual Private Network (VPN):** A method of keeping the presence of and network technologies belonging to particular users secure and hidden from other users on the same network infrastructure.

**Wi-Fi:** A local area network that uses high frequency radio signals to transmit and receive data over distances of a few hundred feet.

**X10:** One of the oldest protocols still used in home and building automation. Developed in the in the 1970s, it uses the power lines in your home to allow communication between technologies. This simple system is very reliable, but not as capable as modern protocols.

**Z-Wave:** A wireless communications protocol designed for home automation. It is mainly used in the residential space to provide a simple yet reliable way to wirelessly control lighting, locks, HVAC, and window treatments.

**ZigBee:** A low-cost, low-power, wireless mesh network designed to be used with technologies or sensors that had very low power consumption and did not need to send large amounts of data.

## APPENDIX B: SMART SAFETY & SECURITY TECHNOLOGY

**Table B1: Smart Cameras & Monitors**

Name	Features	Price Range	Warranty Duration
Amazon Cloud Security Cam	Captures video surveillance of home when away. Gives notifications of activity through a mobile app or website. Provides the viewer with two-way audio.	\$115 - \$125	1 Year with service
Arlo Pro 2 Security Camera	Captures video surveillance and has the following features: 100% wire-free; 1080p HD quality; Rechargeable battery; Wire-free or plugged in; Advanced motion detection; Optional CVR recording upgrade; Works with Amazon Alexa	\$310 - \$320	1 Year
Blink XT2 Outdoor/Indoor Smart Security Camera	Get peace of mind with this versatile indoor/outdoor wire-free camera that features 2-year battery life, 2-way audio, customizable motion detection, and live-view recording.	\$95 - \$105	1 Year
GE Wireless Digital Camera	Provides Wi-Fi activated smart security monitoring for indoor or outdoor the home. Connects to other Wi-Fi enabled technologies such as a smartphone to provide video surveillance.	\$80 - \$125	90 Days
Logitech Circle 2 Security Camera	Indoor and outdoor, weatherproof, wired or 100% wire-free 1080p full HD home security camera with night vision and up to 180° wide-angle field-of-view. Key features include: 1080p full HD video, 180-	\$165 - \$175	1 Year

	degree wide-angle view, Night vision up to 15-feet, Free 24-hour secure cloud storage, Free smart alerts with snapshots, Two-way talk speaker and microphone. Premium features include: Person detection, Motion zones, custom Time-lapse Day		
Lynx Solar™ Weatherproof Outdoor WiFi Surveillance Camera with Solar Panel	As the first fully integrated solar-powered camera in the market, Lynx Solar needs only 1 sunny day to power the camera for up to 7 days*. If there is an outage of power/internet, Lynx Solar stores up to 3 days of data; once power/internet returns, local data is uploaded to the cloud. Upload pictures of friends and family to your facial recognition library and receive check-in notifications from familiar faces, and alert notifications if strangers show up.	\$195 - \$205	2 Years
Nest Cam Indoor	Set this sturdy cam on a table, attach the base to a magnetic surface, or give it a more permanent install with the included hardware (this method will take a little longer). It doesn't currently work directly with any voice control products, but you can connect it to other devices through IFTTT, Wink or Nest's own smart home platform.	\$165 - \$175	2 Years
NETATMO Presence Smart Outdoor Security Camera with Integrated floodlight	Have alerts sent directly to your smartphone when an intruder or vehicle enters your property. Presence can distinguish between people, cars and animals. Presence will tell you if someone is loitering around your home, if a car enters your driveway or if animals are in the garden. Receive customized notifications that match your needs.	\$295 - \$305	2 Years

	You can also choose not to receive alerts for animals. The Alert-Zones feature allows you to select specific areas for alerts if the camera detects a person, animal or car.		
Piper nv Smart Home Security System with Night Vision	Video home security system that sends alerts to a smartphone when there is unsuspecting motion or activity.	\$195 - \$205	N/A
Reolink Argus Security Camera	Reolink Argus is a 100% wire-free battery-powered/operated weatherproof outdoor/indoor security camera. This camera will wake up at once when the smart PIR motion sensor detects motion events or when you view live streaming. You will get app push notifications, email snapshots and voice alerts when there are dangers. On the live view, you can not only see what's going on, but also listen and talk back with the built-in mic & speaker. Use Reolink Argus as a webcam even with no power outlets, to view your home/business via free Reolink app anytime and anywhere.	\$60 - \$70	2 Years
Ring Floodlight Security Camera	Captures video surveillance and has the following features: Rechargeable; Night vision; Indoor/Outdoor; 1080p; 2-Way Audio; Wall Mount; Cloud Storage Included	\$250 - \$260	1 Year

**Table B2: Smart Door Bells**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
Nest Hello Doorbell Camera	Doorbell camera to view and interact with visitors at the door. Can view and talk to people from your smartphone or other device.	\$225 - \$235	2 Years
Ring Video Doorbell	Connects with Alexa and smartphone or tablet for Wi-Fi activated security. Has a camera to hear, speak to, or see anyone at the front door.	\$95 - \$500	1 Year

**Table B3: Smart Door Locks**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
ADT Pulse	Smart home security that allows remote arming/disarming of home security via app. Provides security alerts and notifications as specified.	With remote; \$52.99/month. With video; \$59.99/month (Sold by ADT)	Monthly fee for Services
Amazon Cloud Security Cam	Captures video surveillance of home when away. Gives notifications of activity through a mobile app or website. Provides the viewer with two-way audio.	\$115 - \$125	1 Year with Service
August Smart Lock	Lock and unlock your door with keyless access to entry with your phone.	\$120 -255	1 Year
Nest Hello Doorbell Camera	Doorbell camera to view and interact with visitors at the door. Can view and talk to people from your smartphone or other device.	\$225 - \$235	2 Years
Ring-Floodlight Cam	Outdoor lighting system that turns on flood lights at the detection of motion while also alerting a mobile device.	\$245 - \$255	1 Year

**Table B4: Smart Leak Detectors**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
Flo Leak Detection System	Provides remote automatic water shutoff through a smartphone app, gives alerts to a smartphone when maintenance is needed, performs daily tests to detect leaks and identify issues.	\$490 - \$500	1 Year
Floodie	Sends immediate alerts to a smartphone when the device detects leakage or floods.	\$85 - \$95	1 Year
Honeywell Lyric Wi-Fi Water Leak Detector	Alerts smartphone when the device detects a water leak or freeze. Connects to home Wi-Fi.	\$65 - \$85	2 Years
Flowie Waterflow Sensor	Connects to water meter to detect water.	\$390 - \$400	1 Year
Samsung SmartThings Water Leak Sensor	Alerts smartphone when the device detects excess water.	\$20 - \$30	1 Year
Wasserstein Smart Wifi Water Sensor	Alerts smartphone when there is a present or potential water leak in a home. Connects to home Wi-Fi and provides information via the Wasserstein app on smartphones.	\$25 - \$55	30 Days

**Table B5: Smart Lighting & Dimmer Controls**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
Cree LED Lightbulb – 4 pack	When connected to a hub, can turn on, off, and dim from remote locations via connection.	\$15 - \$20	3 Years
Ikea Trådfri LED bulb	Connects to compatible technologies (Alexa, Android, iOS) to allow for remote control of lighting, dimming, and timing of lights. Can use the wireless dimmer or TRÅDFRI remote control to control up to 10 LED light bulbs, LED light panels or LED light doors. Also compatible with Trådfri motion sensors	\$20 - \$30	2 Years
LIFX Mini Wi-Fi Smart LED Light Bulb - 1 pack	Connects to compatible technologies (Alexa, Android, iOS) to allow for remote control of lighting, dimming, and timing of lights.	\$20 - \$40	2 Years
Lutron Caseta Wireless Smart Lighting Dimmer Switch- 2 pack	Connects to compatible technologies (Alexa, Android, iOS) to allow for remote control of dimming and usage of lighting.	\$155 - \$190	2 Years

**Table B5: Smart Lighting & Dimmer Controls (continued)**

GE C-Sleep Lightbulb – 4 pack	Connects with Amazon Alexa or Google Assistant to control lighting from remote locations. Ability to group bulbs to control many at once. No hub required.	\$65 - \$75	2 Years
Philips Hue – 4 pack	Automated light control from home or away via app, or other Smart Technology such as Echo or Nest.	\$175 - \$200	3 Years
Sengled Smart LED Soft White A19 Starter Kit (Hub and 2 bulbs)	Use the Sengled Smart LED Starter Kit to transform your space with a single tap in Sengled Home app (iOS/Android) or a simple voice command. Compatible with Alexa and Google Assistant. Create scenes, set schedules, dim or brighten, and more with the app.	\$25 - \$35	3 Years
TP-Link Kasa Smart WiFi Light Bulb	Dimmable, no hub required, control from anywhere, and compatible with voice control. Use simple voice commands to control your Kasa Smart dimmable light bulb with any Amazon Alexa, Google Assistant or Microsoft Cortana. Just tell your voice assistant to dim your lights and set the perfect mood for movie night.	\$15 - \$25	2 Years
Wiz BR30 Smart WiFi Connected LED Light (3 bulbs)	Wiz Wi-Fi connected LED BR30 smart bulb brings the ultimate light experience to your home, office, shop or hospitality business. Dimmable, 64 thousand shades of white, 16 million colors. Works with Alexa, Google Assistant and Siri Shortcuts. No hub required.	\$80 - \$90	5 Years

**Table B6: Smart Occupancy Sensors**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
BeSense Zwave Ceiling PIR Motion Detector	Ceiling motion detector alerts connected technologies when someone is in the home. Connects to smart hubs to activate programmed home controls such as lighting and temperature.	\$25 - \$30	1 Year
Nest Tag	Touch the device to disarm your Nest-connected alarm system to alert the home of occupancy.	\$20 - \$30	2 Years
Philips Hue Motion Sensor	Wall mounted or freestanding device which controls lighting when someone walks into or leaves a room.	\$35 - \$45	10 Years
Samsung SmartThings Arrival Sensor	Receive an alert to your smart device when someone arrives at or leaves your home. This device can also be programmed to trigger lights or locks when a person arrives at or leaves the home.	\$15 - \$20	1 Year
Wink Door Window Sensor	Alerts your Wink Hub if doors and windows are opened, notifying the user through the Wink App if anyone has entered the home.	\$25 - \$35	1 Year

**Table B7: Smart Smoke & Carbon Monoxide Detectors**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
Honeywell Xiaomi Mijia Alarm	Provides remote alerts to connected technologies and smartphones when smoke is detected in the home.	\$30 - \$40	1 Year
First Alert Oneline Safe and Sound Smart Hardwired Smoke and Carbon Monoxide Alarm	Alerts smart device through the Onelink app if there is a detection of smoke or carbon monoxide in the air. Has a built-in Amazon Alexa.	\$245- \$255	90 Days
Leeo Smart Alert Smoke/Carbon Monoxide Remote Alarm	Monitors existing smoke, CM, and water alarms and alerts you via smartphone app or phone call if there are issues. Can alert friends, family, and local emergency services of emergency detections.	\$95 - \$105	1 Year
Nest Protect Smoke and Carbon Monoxide Alarm Battery	Connects through Wi-Fi to Smart Home Technologies to alert user of smoke and/or carbon monoxide in the air.	\$115 - \$125	2 Years
Samsung SmartThings ADT Smoke Alarm	Alerts connected technologies when there is smoke or high temperatures in the home. Has the option of connecting with ADT services and professional monitoring. Requires use of an ADT Security Hub.	\$70 - \$80	1 Year

## APPENDIX C: SMART COMFORT TECHNOLOGY

**Table C1: Smart Air Quality Sensors/Smart Air Purifiers**

Name	Features	Price Range	Warranty Duration
Awair Air Quality Monitor	Monitors home air composition by tracking toxins, dust, and chemicals. Connects to home technologies such as Nest, Alexa, smartphones, and tablets to provide information feedback.	\$160 - \$170	30 Days
Foobot Air Quality Monitor	Sends data to a smartphone or tablet about home air quality. Uses colored LED lights to show the user what the air temperature, humidity, and purity is like. Connects with other Smart Home Technologies such as Nest and Amazon Echo.	\$195 - \$205	1 Year
Levoit Air Purifier and Sensor	Levoit purifies the air by ridding home air of toxins, dust, and other particles. The device provides smart feedback by suggesting specific use of fan speed to keep air cleaner. The device has a sleep mode to adjust the purifier to the needs of the user at night.	\$85 - \$160	2 Years
Wynd Wearable Air Quality Tracker	This wearable and portable technology connects to a mobile app on Smartphone or tablet to monitor air quality anywhere you go. Through the app, it provides information on the level of particles in the environment such as allergens and fuels.	\$75 - \$80	1 Year

**Table C2: Smart Thermostats**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
Honeywell	Adjust temperature from a remote location via computer, tablet, or smartphone; creates energy savings, touchscreen, large panel visual, connects to Amazon Alexa for voice control.	\$95 - \$210	1 Year
Lux GEO	Use with or without Wi-Fi, 7-day programming, air filter monitor, and large backlit display.	\$95 - \$160	3 Years
Nest Thermostat	Adjusts temperature based on personal habits, large, clear display; efficient temperature control; connects to Amazon Alexa for voice control.	\$205 - \$250	2 Years
Sensi Touch Wi-Fi Thermostat	Smart alerts, automatic upgrades, color shift, back glow, humidity readings, brightness adjust, easy do-it-yourself installation, and a seamless smart home integration	\$145 - \$170	3 Years
Bosch Connected Control	Weather access, 5" full-color touch screen, compatible with most HVAC systems, programmable.	\$160 - \$170	5 Years

## APPENDIX D: SMART CONTROL TECHNOLOGY

**Table D1: Digital Home Assistants**

Name	Features	Price Range	Warranty Duration
Amazon Echo	Responds to voice commands to control other home technologies and complete tasks such as report the weather, play music, and create calendar events.	\$45 - \$230	1 Year
Apple Home Pod	Plays music by adapting to the speaker's and user's environment. Also acts as a home assistant through the voice detecting use of Siri to answer questions and complete tasks.	\$295 - \$350	1 Year
Google Home Assistant	Responds to voice commands to control other home technologies and complete tasks such as report the weather, play music, and create calendar events.	\$45 - \$130	1 Year
Insignia Voice	Voice activation plays songs for the user. Pairs to other technologies through Wi-Fi and Bluetooth. The device has a built-in Google Assistant to answer questions and access the Internet.	\$45 - \$55	1 Year
Ultimate Ears	Voice activation plays songs for the user. The device has a built-in Amazon Alexa to answer questions and complete tasks with Wi-Fi connectivity.	\$190 - \$250	2 Years

**Table D2: In-Home Displays**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
CEIVA Homeview	This Wi-Fi connected 8-inch display allows for instant home energy updates. Receive not only photos from anywhere in the world, but also alerts and messages from your utility. Homeview can monitor and control a wide variety of Smart Technology. <b>Compatible with Ameren smart meters.</b>	\$140 - \$160	Lifetime
CURB Home Energy Monitoring System	Home energy monitoring system that attaches to a breaker panel to show individual appliance energy consumption. Communicates to the resident through iOS or android technologies to give updates on usage and projected costs.	\$395 - \$405	N/A
Neurio	Home energy monitoring system that provides cost updates and notifications to a smartphone or device to better understand home energy usage and areas for savings.	\$215 - \$225	N/A

**Table D2: In-Home Displays (continued)**

Sense Home Smart Meter	<p>Device that installs into home electrical panel that monitors power usage. Sends notifications to a smartphone or device about usage monitoring and changes. The device learns patterns in energy use to maximize efficiency while lowering cost.</p> <p><i>NOTE: The Sense Home Smart Meter is not a traditional in-home display in that it primarily provides information relevant to energy management and monitoring.</i></p>	\$295 - \$350	60 Days Full Refund
Smappee	<p>Smappee is an appliance-focused meter that monitors energy usage from technologies such as a heat pump or electric car. Via smartphone or device, Smappee provides the user with information on energy usage per individual technologies and factors. It provides alerts if there are leaks or errors in energy usage to create cost savings.</p>	\$245 - \$350	30 Days Full Refund
TED Pro Home Electricity Monitor	<p>Monitors electricity usage in the home and communicates with resident and utility company on high areas of usage and ways to cut monthly bills. Compatible with smartphones and Alexa.</p>	\$295 - \$500	N/A

**Table D3: Smart Hubs**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
Iris Smart Hub	This Smart Hub is the heart of the Iris Network and allows control of your connected technologies using the Iris app.	\$65 - \$75	1 Year
Logitech Harmony Hub	The Logitech Harmony Hub connects with over 270,000 entertainment and smart home technologies. You will have the ability to control the Harmony Hub by using your smartphone or tablet.	\$70 - \$100	1 Year
Phillips Hue Bridge (2nd Generation)	Control lighting, adjust thermostat, or lock doors via voice commands.	\$50 - \$60	2 Years
Samsung SmartThings Hub	Connects a variety of Smart Home Technologies, compatible on App, connects with Echo, learns household behaviors by monitoring technologies at all times.	\$80 - \$90	1 Year
Wink Connected Home Hub	Connects multiple Smart Home Technologies, sets patterns and connects technologies in the house; allows for easy control via Wink App.	\$25 - \$35	1 Year

## APPENDIX E: SMART CONVENIENCE TECHNOLOGY

**Table E1: Smart Appliances**

Name	Features	Price Range	Warranty Duration
Behmor Smart Coffee Maker	Remote control of your coffee maker via smartphone or device. Connects with Amazon Alexa and Amazon Dash.	\$165 - \$175	N/A
Kenmore Smart Dryer	Remote control of your dryer via smartphone or device.	\$985 - \$1,150	1 Year
LG InstaView Door in Door	Voice activation through Google Assistant, gives notifications of open door for energy efficiency.	\$1,895 - \$2,695	1 Year
Samsung Flex Duo Smart Oven	Control and monitor cooking activities through Wi-Fi connectivity.	\$2,195 - 2,395	1 Year
Samsung High Efficiency front-load washer	Remote control of your washer through Wi-Fi connectivity.	\$995 - \$1,045	1 Year

**Table E2: Smart Plugs**

<b>Name</b>	<b>Features</b>	<b>Price Range</b>	<b>Warranty Duration</b>
Belkin Smart plug	Connects with Alexa and Google assistant to provide remote control of technologies.	\$25 - \$35	N/A
Geeni Spot Smart Plug – Single plug	Control technologies through Google Assistant, Amazon Alexa, voice control, or through Wi-Fi connectivity to smart device.	\$15 - \$25	1 Year
iHome iSP8 SmartPlug	Smart plug lets you control any connected device from home or remotely: turn off the heat, turn on a light- it's all at your fingertips. Home Kit system from Apple makes control of compliant Devices simple and standardized. Control plugs with Siri individually or as a group. Works with Wink app and Nest learning thermostats. Includes power consumption monitoring of devices connected to smart plug. Works with included remote control to turn devices on or off without using a smartphone or tablet.	\$45 - \$55	1 Year
Kisslink Mini Smart Plug Mini	Connects with Alexa, iOS, and Android to provide remote control of Smart Home Technologies via smartphone or device	\$10 - \$25	1 Year
Mini Smart plug (Amazon)	Connects with Alexa and Google Smart home.	\$10 - \$20	N/A

<b>Table E2: Smart Plugs (<i>continued</i>)</b>			
youxiu smart plug (Amazon)	Connects with Alexa, iOS, and Android to provide remote control of Smart Home Technologies via smartphone or device.	\$10 - \$20	N/A

## APPENDIX F: COST EFFICIENCY SERVICES

**Table F1. Utility Services in Illinois**

<b>Services</b>	<b><i>Ameren Illinois</i></b>	<b><i>ComEd</i></b>
Real-Time or Hourly Pricing Programs	Online at: <a href="https://www.powersmartpricing.org/">https://www.powersmartpricing.org/</a>  By Phone at: 877-655-6028	Online at: <a href="https://hourlypricing.comed.com/">https://hourlypricing.comed.com/</a>  By Phone at: 888-202-7787
Peak Time Savings or Rewards Programs	Online at: <a href="https://peaktimerewards.com/">https://peaktimerewards.com/</a>  By Phone at: 844-787-7874	Online at: <a href="http://www.ComEd.com/PTS">www.ComEd.com/PTS</a>  By Phone at: 844-852-0347
Home Area Network or Connected Device Programs	Online at: <a href="https://www.ameren.com/illinois/account/customer-service/smart-meters/home-area-network">https://www.ameren.com/illinois/account/customer-service/smart-meters/home-area-network</a>  By Phone at: 800-755-5000	Online at: <a href="https://www.comed.com/WaysToSave/ForYourHome/Pages/SmartMeterConnectedDevices.aspx">https://www.comed.com/WaysToSave/ForYourHome/Pages/SmartMeterConnectedDevices.aspx</a>  By Phone at: 630-437-2521
Online Customer Accounts	Online at: <a href="https://www.ameren.com/account/login">https://www.ameren.com/account/login</a>  By Phone at: 800-755-5000	Online at: <a href="https://www.comed.com/WaysToSave/ForYourHome/Pages/MyAccountOnlineTools.aspx">https://www.comed.com/WaysToSave/ForYourHome/Pages/MyAccountOnlineTools.aspx</a>  By Phone at: 800-334-7661

Traditional Energy Efficiency Programs	Online at: <a href="https://amerenillinoisavings.com/energy-savings-center">https://amerenillinoisavings.com/energy-savings-center</a> By Phone at: 800-755-5000	Online at: <a href="https://www.comed.com/WaysToSave/ForYourHome/Pages/default.aspx">https://www.comed.com/WaysToSave/ForYourHome/Pages/default.aspx</a> By Phone at: 800-334-7661
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