ELECTRICITY 101

MISSOURI RIVER® ENERGY SERVICES

A Basic Guide to the Electric Power Industry

ACRONYM GUIDE FOR COMMONLY USED TERMS IN THE UTILITY INDUSTRY

AMI: Advanced Metering Infrastructure. An integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers – known as the backbone of Smart Grid.

AMR: Automated Meter Reading.

Amp: Stands for ampere, the basic unit of electric current.

CAA: Clean Air Act. A U.S. federal law designed to control air pollution on a national level.

CON: Certificate of Need. A legal document required in many states and some federal jurisdictions before proposed acquisitions, expansions, or creations of facilities are allowed.

CPP: Clean Power Plan. An Obama Administration policy aimed at combating climate change as a result of human activity.

DG: Distributed Generation. Generally, the generation of electricity from smaller resources spread throughout the area of the load, rather than a single, large central-station generating plant that relies heavily on high-voltage transmission lines (HVTLs) to distribute electricity.

DOE: U.S. Department of Energy. www.energy.gov

DR and CDR: Demand Response and Coordinated Demand Response. Demand response is the shifting of demand for electricity to non-peak periods, or reducing electricity use during periods of high use or peak times to help prevent strain on an electric system or to avoid higher electricity prices. Coordinated demand response is a DR program that can work across a number of electric systems that are connected to a single load-control monitoring and management system. Missouri River Energy Services offers its members the opportunity to participate in a CDR effort that is part of its Bright Energy Solutions® program.

DSM: Demand-Side Management. Includes both energy-efficiency measures aimed at reducing electric demand and energy usage and load-management efforts to regulate time of use. Also referred to as energy efficiency.

EIA: Energy Information Administration. A division of the U.S. Department of Energy that provides national energy statistics. www.eia.doe.gov

EIS: Environmental Impact Statement. A document required by federal environmental laws for certain actions (such as constructing a power plant) that have the potential to significantly affect the quality of the human environment.

EPA: U.S. Environmental Protection Agency. www.epa.gov

EPRI: Electric Power Research Institute. An independent non-profit organization that conducts research, development, and demonstrations related to the generation, delivery, and use of electricity. www.epri.com

ESA: Endangered Species Act of 1973. A federal law aimed at protecting critically imperiled species from extinction "as a consequence of economic growth and development untampered by adequate concern and conservation."

EV: Electric vehicle.

FCC: Federal Communications Commission. www.fcc.gov

FERC: Federal Energy Regulatory Commission. www.ferc.gov

G&T: Generation and Transmission Cooperative.

GW: Gigawatt. 1,000 megawatts (MW) or 1 million kilowatts (KW).

GWh: Gigawatt-hour. The consumption of one gigawatt of electricity over one hour.

HVTL: High-Voltage Transmission Line. In general, a power line with a capacity of 100 kilovolts (kV) or more.

IEEE: Institute of Electrical & Electronics Engineers. A professional organization dedicated to advancing technology.

IGCC: Integrated Gasification Combined Cycle. A technology that turns coal into gas.

IOU: Investor-Owned Utility.

IRP: Integrated Resource Plan.

ISO: Independent System Operator. A neutral organization that administers a region's wholesale electricity markets in an effort to provide reliability planning for the region's electrical power system.

kV: Kilovolt. The basic measurement of electric transmission line-carrying capacity.

kW: Kilowatt. 1,000 watts.

kWh: Kilowatt-hour. The consumption of one kilowatt of electricity over one hour.

Load Management: An effort to regulate the amount of energy consumed at a given point in time. Load management programs include air conditioner and water heater controls that cycle the runtime of the appliance.

MISO: Midcontinent Independent System Operator. A not-for-profit member based organization that is designed to ensure reliable, least-cost delivery of electricity across all or parts of 15 U.S. states and one Canadian province. MISO manages approximately 65,000 miles of high-voltage transmission and 200,000 megawatts of power-generating resources across its footprint. www.misoenergy.org

MW: Megawatt. 1,000 kilowatts (kW) or 1 million watts.

MWh: Megawatt-hour. The consumption of one megawatt of electricity over one hour.

NERC: North American Electric Reliability Corporation. The not-for-profit international electric reliability organization for North America whose mission is to protect the adequacy, reliability, and security of the bulk electric system. www.nerc.com

NHA: National Hydropower Association. A nonprofit association dedicated to promoting the growth of clean, renewable hydropower and marine energy. www.hydro.org

PMA: Power Marketing Administration: Any of four federal agencies of the U.S. Department of Energy that have the responsibility for marketing electricity produced at federally owned and operated hydroelectric dams across the country.

PPA: Power Purchase Agreement. An agreement under which one utility purchases capacity or energy from another utility for a given period of time.

PURPA: Public Utility Regulatory Policies Act of 1978. www.gpo.gov/fdsys/pkg/STATUTE-92/pdf/STATUTE-92-Pg3117.pdf

REO: Renewable Energy Objective. An objective established by a state to achieve a goal of retail electricity sales within that state are obtained from renewable energy resources.

RES: Renewable Energy Standard. A state-required minimum of renewable energy in a utility's generation portfolio.

RTO: Regional Transmission Organization. An independent electric power transmission system operator that coordinates, controls, and monitors a multi-state electric grid with the purpose of promoting economic efficiency, reliability, and non-discriminatory practices will reducing government oversight.

SPP: Southwest Power Pool. SPP oversees the bulk electric grid and wholesale power market in the central United States on behalf of a diverse group of utilities and transmission companies in 14 states. Its mission is to ensure the reliable supply of power, adequate transmission infrastructure, and competitive wholesale electricity prices for a 546,000-square-mile region including more than 60,000 miles of high-voltage transmission lines. www.spp.org

USACE: U.S. Army Corps of Engineers.

V: Volt. The basic unit of electric potential

W: Watt. The basic unit of power or rate at which work is done.

WAPA: Western Area Power Administration. The federal power marketing administration that is responsible for marketing power generated in the upper Midwest by the hydroelectric dams on the Missouri River. www.wapa.gov

ACRONYM GUIDE FOR TERMS COMMONLY USED AT AND BY MISSOURI RIVER ENERGY SERVICES

APPA: American Public Power Association. Trade association for municipal utilities and municipal power agencies in the United States. www.publicpower.org

BES: Bright Energy Solutions®. A unique portfolio of energy-efficiency cash incentive programs aimed at helping residential and business customers to save energy and save money by utilizing more efficient lighting, appliances, and other electrical equipment. BES provides rebates to homeowners and businesses that install various types of approved energy-efficient equipment. www.brightenergysolutions.org

CapX 2020: Capacity Expansion by the Year 2020. A group of utilities, including MRES, that have worked to strengthen transmission infrastructure in the Upper Midwest to accommodate projected increased demand for electricity. www.capx2020.com

IAMU: Iowa Association of Municipal Utilities. IAMU represents more than 754 municipal broadband, electric, gas, and water utilities in the State of Iowa, and maintains a marketing relationship with more than 160 associate member businesses. www.iamu.org

MMUA: Minnesota Municipal Utilities Association. MMUA represents the interests of Minnesota's municipal electric, gas, and water utilities. www.mmua.org

Electricity is used everywhere—

computers, lighting, industrial applications, medical devices, water heaters, TVs—the list is nearly endless. Electricity enhances the quality of life for almost all of us, and yet, we don't think about electricity until we flip the switch and the light doesn't turn on. New technologies and the growth of existing ones often have the goal of enhancing the quality of life on our planet. At Missouri River Energy Services (MRES), we believe in a balanced approach to the complex energy opportunities and challenges facing our nation and the environment in which we all work and live. We have a responsibility to provide our members with a diverse, stable energy supply that reduces risk, enhances reliability, and provides cost-effective service. Renewable resources account for nearly half of the electrical energy used by MRES members. Coal-fired generation comprises the largest share of the remainder, however, that is changing. Today our electric generating portfolio continues to grow in diversity with additions of natural gas, wind, nuclear, solar, and hydro along with increasingly aggressive efforts to promote energy efficiency and reductions in peak demand growth.

This booklet is intended to explain the complexities of electricity and the electric power industry, and to introduce the key issues that could potentially affect and transform our nation's energy future.

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FAST FACTS ABOUT MRES AND ITS MEMBERS

ABOUT MRES

Missouri River Energy Services is a not-for-profit wholesale supplier of energy and energy-related services to our member municipal utilities in Iowa, Minnesota, North Dakota, and South Dakota.

OUR MISSION

MRES is dedicated to supplying our members with reliable, cost-effective, long-term energy and energy services in a fiscally responsible and environmentally sensitive manner. MRES is an extension of our members, and through joint action, members will remain competitive while enhancing their relationships with their customers.

ABOUT OUR MEMBERS

MRES members are public power communities. That means their electric distribution utilities are owned and regulated by the people they serve—the citizens of the community. MRES is an extension of that public power principle. MRES is governed by a Board of 13 directors and one alternate who are elected by and from the ranks of its member representatives. Each member of the Board is also a utility manager or city manager for the member city he or she represents.

MRES members receive their electric power from a variety of generating resources. On average, slightly less than half of their electricity comes from renewable hydroelectric, wind, and solar facilities. The rest comes from coal, natural gas, nuclear, fuel oil, and diesel fuel. The diverse generation mix of MRES helps members maintain retail electric rates that rank among the lowest in the United States.

The average MRES member community has a population of about 6,400 residents, some 2,600 electric meters per utility, covers 5.6 square miles, and has seven employees on its utility staff. Our largest member in terms of population is Moorhead, Minn., with more than 42,000 residents, while Pickstown, S.D., and Riverdale, N.D., are the smallest with populations of fewer than 250 residents each.

MISSOURI RIVER ENERGY SERVICES MEMBERS

IOWA
Alton
Atlantic
Denison
Hartley
Hawarden
Kimballton
Lake Park
Manilla
Orange City
Paullina
Pella
Primghar
Remsen
Rock Rapids
Sanborn
Sioux Center
Woodbine

MINNESOTA
Adrian
Alexandria
Barnesville
Benson
Breckenridge
Detroit Lakes
Elbow Lake
Henning
Hutchinson
Jackson
Lake Park
Lakefield
Luverne
Madison
Marshall
Melrose
Moorhead
Ortonville
Sauk Centre
St. James
Staples
Wadena
Westbrook
Willmar
Worthington

NORTH DAKOTA
Cavalier
Hillsboro
Lakota
Northwood
Riverdale
Valley City

SOUTH DAKOTA
Beresford
Big Stone City
Brookings
Burke
Faith
Flandreau
Fort Pierre
Pickstown
Pierre
Vermillion
Watertown
Winner

Who are the industry players?

The electric utility industry generally is composed of four types of organizations with different business structures that deliver electricity to their retail or "end-use" customers. These organizational types are municipals, rural electric cooperatives, investor-owned utilities, and federal entities.

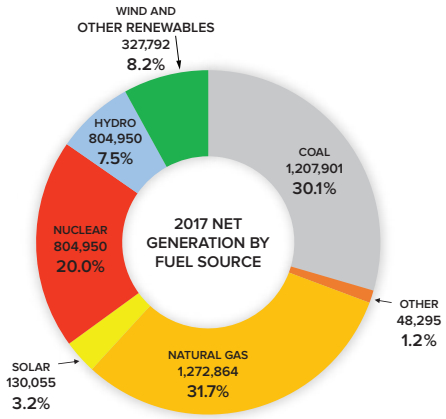
Municipal electric utilities, also known as public power utilities, are not-for-profit electric utilities that are owned by the customers they serve and are operated by state or local governments. There are more than 2,000 public power utilities across the nation, and they provide for the electricity needs of about 15 percent of the nation's electric consumers. Many of these public power utilities are members of joint-action agencies, such as MRES, through which they work together to provide for their mutual power supply and important energy-related services.

Rural electric cooperatives (often referred to as RECs or co-ops) also are not-for-profit utilities, and they are privately owned by the members they serve. RECs typically serve customers in sparsely populated areas. Together, about 900 RECs provide for the electricity needs of about 13 percent of the nation's electricity consumers.

Investor-owned utilities (IOUs) are the largest segment of the utility industry in terms of electric generating capability, sales, and revenue in the U.S. IOUs are for-profit utilities owned by shareholders. Their primary objective is to earn a return for their investors. There are about 200 IOUs in the U.S., and they provide electricity to about 68 percent of the nation's electricity consumers.

Federal entities also generate and sell electricity to wholesale and some retail customers. In this region, most of the electricity provided by federal entities is hydropower from federally owned dams that is sold at cost-based rates. Cost-based means that rates are set to recover all costs of producing the power. The federal power marketing agency serving our region is the Western Area Power Administration (WAPA).

Municipal electric systems and joint-action agencies along with rural electric cooperatives are consumer-owned utilities. While the rates of consumer-owned utilities are regulated by locally elected or appointed boards who represent the customer/owners, they are subject to the same state and federal regulation that investor-owned utilities face in regard to service, reliability, safety, cybersecurity, physical security, and more.



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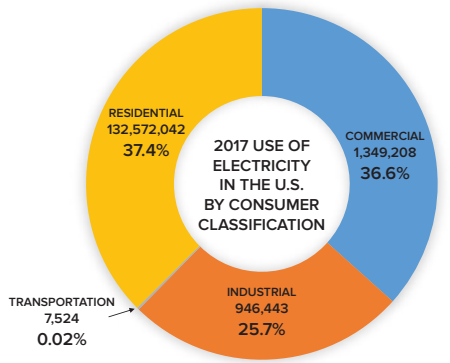

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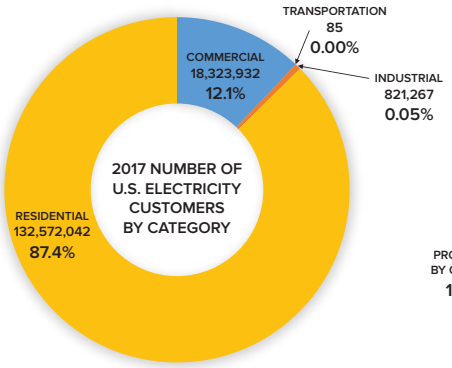

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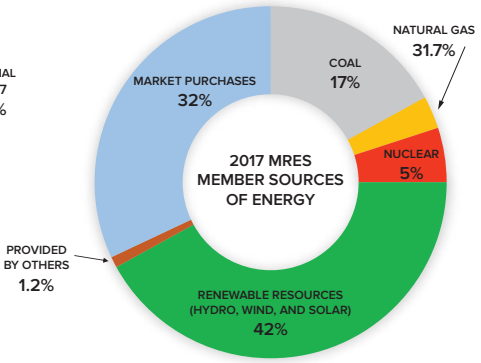


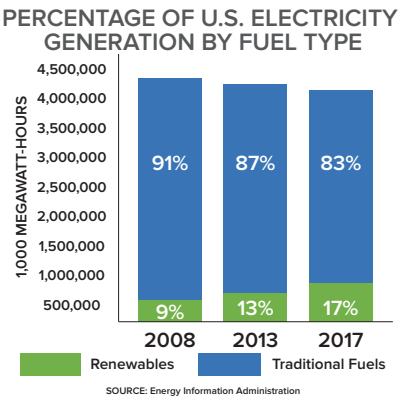
Who are the customers?

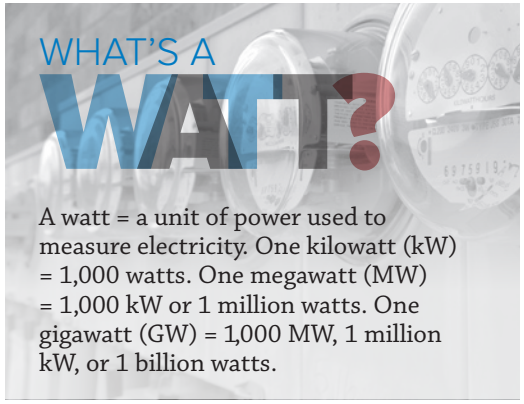
There are three main categories of customers in the electric utility industry: residential, commercial, and industrial.

Residential customers are the individuals and families who occupy houses, apartments, condos, and other dwellings. Commercial and industrial customers include small and large businesses such as hospitals, hotels, restaurants, grocery stores, food processing plants, gas stations, department stores, manufacturing plants, ethanol plants, factories, and more.

What energy sources are used in the United States?

Three fuel sources—coal, nuclear, and natural gas—produce about 83 percent of the electricity generated in the United States, according to the federal government's Energy Information Administration (EIA). Electricity also is produced from renewable fuels such as water (hydroelectricity), geothermal, wind, sun (solar), and biomass.





In the 1950s and 1960s, most of the municipal utilities that today are MRES members elected to purchase power from the federal government, which was building flood-control dams along the Missouri River that also included hydroelectric facilities. Today, federal hydropower supplies about 35 percent of our members' electrical needs. Combined with wind and solar resources from MRES, renewable resources supply about 42 percent of our members' electrical needs.

WHAT TO USE? WHAT TO CHOOSE?

Utilities generally rely on a variety of fuel sources to generate electricity. The combination of these sources is known as the "fuel mix" or "portfolio." A diverse fuel mix helps ensure that, in the event of fluctuating fuel prices, new electric technologies, limited fuel supplies, or changing regulatory/environmental policies, electric utilities can still reliably and economically serve their customers.

A variety of factors come into play when electric utilities determine which fuels to use for generating electricity. The most important considerations are price, availability, reliability, consumer preferences, and environmental concerns. Energy policies adopted by federal and state governments that promote certain types of fuels also influence the fuel choices made by utilities. Another factor to consider is the intended power plant usage (a power plant that is intended to be used 24 hours a day, seven days a week is known as a baseload plant, while a power plant that is generally intended to be used during times of high demand and in emergency situations is known as a peaking plant).

Characteristics of Electricity Generating Technologies

TYPE OF GENERATION	TYPICAL DUTY	FUEL
Single-Cycle Combustion Turbine	Peaking	Natural Gas
Combined-Cycle Combustion Turbine	Intermediate-Baseload	Natural Gas
Coal (Supercritical Pulverized)	Baseload	Coal
Integrated Gasification Combined Cycle (without CO2 Capture)	Baseload	Coal
Integrated Gasification Combined Cycle (with CO2 Capture)	Baseload	Coal
Nuclear	Baseload	Nuclear
Wind	Intermittent	Wind
Solar	Intermittent	Sun
Hydro	Baseload to Peaking	Water
Biomass	Baseload	Organic materials

What are the challenges facing each fuel source?

NOTE: The source for all of the data in this section is the U.S. Energy Information Administration.

Coal: In 2017, coal-fired power accounted for about 30 percent of the electricity generated in the U.S. Coal remains a valuable and cost-efficient fuel for baseload generating plants. At the end of 2016, recoverable coal reserves in the U.S. were estimated to be 254 billion tons. Based on 2016 production, that supply would last about 348 years. However, over the past several years, coal as a fuel source has been decreasing as older coal-fired power plants are retired and replaced, often by lower-cost natural gas facilities and renewable generation.

Nuclear: Nuclear power accounted for about 20 percent of the total electricity generated in the U.S., in 2017. Despite societal and political concerns about the use of nuclear power, this zero-emitting fuel source could play a greater role in helping to meet the country's demand for electricity and lessen its dependence on fossil fuels. Building a new nuclear plant is very costly and could take upwards of 20 years. There are currently 61 commercially operating nuclear power plants in the U.S., and 99 nuclear reactors. MRES currently contracts for 33 megawatts of nuclear power.

Natural gas: Natural gas, in 2017, accounted for almost 32 percent of the nation's total electricity generation. In addition to its traditional use as a peaking resource, many utilities have foregone coal plants in favor of natural gas as a baseload resource. The US. Energy Information Administration has estimated that natural gas generation between 2015 and 2030 will increase by 26 percent and by 44 percent by 2040.

Natural gas power plants typically are less expensive and take a shorter time to build than coal or nuclear plants and they emit fewer pollutants than other fossil-fuel plants. However, natural gas prices are historically more volatile than other fuels and, during winter peak hours, natural gas usage for home heating usually has priority over electricity generation. As of year-end 2016, U.S. had 341.1 trillion cubic feet of proved natural gas reserves. Based upon current usage, the supply would last about 90 years. That U.S. total is almost 5 percent of the world's proved reserves.

Hydropower: Hydropower, which generates electricity from falling water, remains as the largest single renewable energy source for electricity generation in the U.S. In 2017, it accounted for about 7.5 percent of the nation's generation, according to EIA. It also is the most reliable and efficient renewable fuel. Hydropower does not emit pollutants and it is continually replenished by rain and snowfall. Among MRES member utilities, hydropower from the federal government's Western Area Power Administration accounts for more than 35 percent of their total wholesale electricity needs.

MRES also is currently constructing a hydroelectric facility of its own—the Red Rock Hydroelectric Project (www.redrockhydroproject.com)—near Pella, Iowa, at the existing Red Rock Dam on the Des Moines River. When complete in 2020, it will provide 36.4 megawatts of renewable baseload power to the MRES generation portfolio, and up to 55 megawatts during summer months when it is needed most.

In addition to supplying renewable energy, hydropower is also a reliable source of energy storage. There are three types of hydropower facilities. First is run-of-river hydropower. Typically, a run-of-river facility channels flowing water from a river through a canal or penstock and operates as the river flows. A run-of-river project will have little or no storage. Second is storage hydropower: typically a large system that uses a dam to store water in a reservoir. Electricity is produced by releasing water from the reservoir through a turbine, which activates a generator. Third is pumped-storage hydropower. This provides peak-load supply, harnessing water that is cycled between a lower and upper reservoir by pumps that use surplus energy from the system at times of low demand and release water from the upper reservoir to run through turbine generators and produce energy at times of high demand. MRES is currently studying such a project in Gregory County, South Dakota.

While hydropower is a limited resource that cannot meet all of the electrical needs of our country, the U.S. Department of Energy estimates that there is the potential to develop more than 65 gigawatts of new hydropower on existing U.S. dams.

TYPES OF POWER PLANTS

Baseload power plant

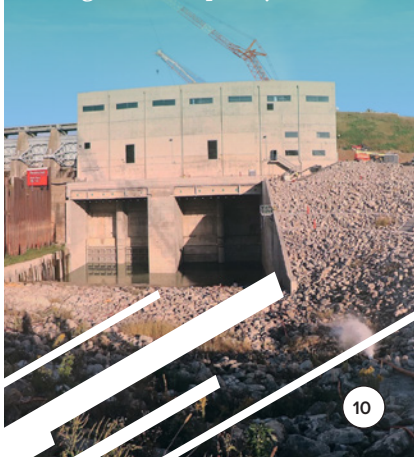
A power plant that generates power continuously to supply most of the energy needed by utility customers. Usually runs 24/7. Fuel sources typically include coal, natural gas, nuclear, or hydropower because they are the most cost-efficient.

Intermediate power plant

A power plant that may run occasionally during non-peak-load seasons and around the clock during peak-load seasons, such as the middle of summer. If needed, produces most of its electricity during the day to meet high demand. Typically powered from natural gas.

Peaking power plant

A power plant that may run when there is a high demand for power, such as in the summer months when air conditioning is needed. Typically powered from natural gas or diesel fuel, and can be brought online quickly.



Wind: Wind is the fastest-growing renewable energy resource in our country. According to the American Wind Energy Association, more than 54,000 wind turbines are currently operating in 41 states, Guam, and Puerto Rico with a combined capacity of nearly 90,000 megawatts. Wind power in the past decade has more than tripled and, in 2017, wind energy accounted for 6.3 percent of the nation's electricity. MRES currently has more than 86 megawatts of wind-generated electricity in its portfolio.

Like hydropower, wind does not emit greenhouse gases, but our country cannot rely on wind alone because it is an intermittent source of power. Because it is intermittent and since there are not sufficient storage resources on the system, wind needs to be supplemented with another resource, usually natural gas, which can operate when the wind is not blowing.

Solar: Solar is gaining ground in the U.S., particularly in the Southwest, where there is ample sunshine and vast areas of unoccupied land. Like wind, solar is intermittent and requires thermal generation for backup. Solar photovoltaic generation also requires a good deal of land—about five acres for one megawatt of solar capacity.

In 2016, the City of Pierre, S.D., a member of MRES, along with MRES jointly developed a 1-megawatt solar project at the Pierre Regional Airport. In addition, other MRES members have built or are considering solar gardens in their communities that provide additional renewable energy for their citizens.

Energy storage: While electricity traditionally is not easily stored, newer technologies mean that energy storage today represents a small but growing resource in the U.S. Energy storage involves capturing excess electrical energy during periods of low demand and storing it in other forms until it is needed and then converting it back to its electrical form.

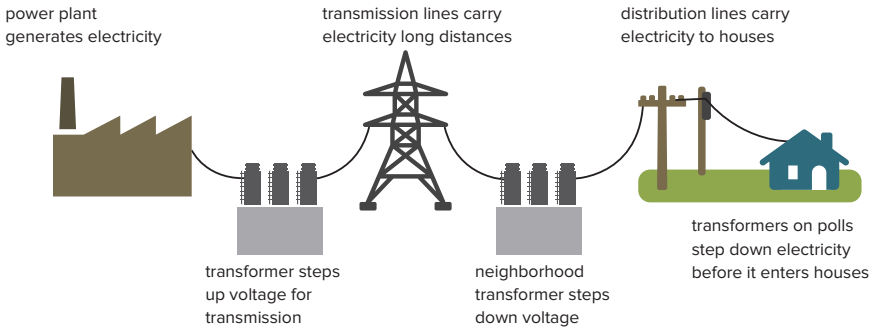
Most current energy storage is in the form of pumped storage hydroelectricity. As indicated above, this method pumps water during non-peak times from a lower elevation reservoir into a higher elevation reservoir. Then, during peak periods, the water is released through hydroelectric turbines to produce electricity.

Other forms of energy storage in the U.S., are mostly being utilized in the East, Southwest, Hawaii, and California. These involve such technologies as battery storage; compressed air storage; ice or cold water thermal storage, and flywheel storage, which works by accelerating a rotor to a very high speed and maintaining the energy in the system as rotational energy.

HOW IS ELECTRICITY DELIVERED?

Once electricity is generated, it must be delivered from its source to the consumer, be it an industry, small business, or home. The delivery process involves high-voltage transmission lines and lower-voltage distribution lines. The illustration below demonstrates this process

ELECTRICITY GENERATION, TRANSMISSION, AND DISTRIBUTION



Transmission and generation owners coordinate with each other, as well as with independent system operator organizations and federal power marketing agencies to efficiently and reliably manage the balanced flow of electricity across the U.S.

The power grid in the U.S. is coordinated mostly through a number of regional transmission organizations (RTOs) and independent system operators (ISOs). Some areas are controlled by individual companies.

RTOs and ISOs coordinate, control, and monitor either a single-state or multi-state electric grid. Their purpose is to promote economic efficiency, reliability and non-discriminatory practices while reducing government oversight.

MRES is a member of two such organizations—the Mid-Continent Independent System Operator (MISO) and the Southwest Power Pool (SPP).

MISO is a not-for-profit member-based organization that ensures reliable, least-cost delivery of electricity across all or parts of 15 U.S. states and one Canadian province. In cooperation with stakeholders, MISO, according to its website—www.misoenergy.org—manages approximately 65,000 miles of high-voltage transmission and 200,000 megawatts of power-generating resources across its footprint.

SPP oversees the bulk electric grid and wholesale power market in the central United States on behalf of a diverse group of utilities and transmission companies in 14 states. SPP, according to its website—www.spp.org—ensures the reliable supply of power, adequate transmission infrastructure, and competitive wholesale electricity prices for a 546,000-square-mile region including more than 60,000 miles of high-voltage transmission lines.

TRANSMISSION = the movement of large amounts of high-voltage electricity. Generally, transmission lines stem from a power plant to a substation. Transmission lines are generally overhead.

SUBSTATION = an electric facility that transforms voltage from high to low, or the reverse. Between a power plant and the consumer, electricity may flow through several substations at different voltage levels.

DISTRIBUTION = the electrical lines that move lower-voltage electricity from substations to customers. Lines can be overhead or underground.

In addition to these regional organizations, MRES and its members adhere to reliability standards set by the North American Electric Reliability Corporation (NERC). NERC, the electric reliability organization for North America, is a not-for-profit international regulatory authority whose mission is to assure the effective and efficient reduction of risks to the reliability and security of the electric grid. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the bulk power system through system awareness; and educates, trains, and certifies industry personnel. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico. NERC is subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. Its jurisdiction includes users, owners, and operators of the bulk power system, which serves more than 334 million people.

ENERGY EFFICIENCY AND EFFICIENT ELECTRIFICATION. HOW BOTH PLAY A ROLE.

The Electric Power Research Institute (EPRI) projects that electricity consumption could rise between 32 and 46 percent by 2050. Furthermore, EPRI says total electric load in the U.S. could grow by as much as 52 percent by 2050 due to expanded adoption of end-use technologies such as 3-D printing, electric vehicles, indoor agriculture, and artificial intelligence. MRES is studying ways to encourage smart growth and cost effectively manage the anticipated increase in electrical demand.

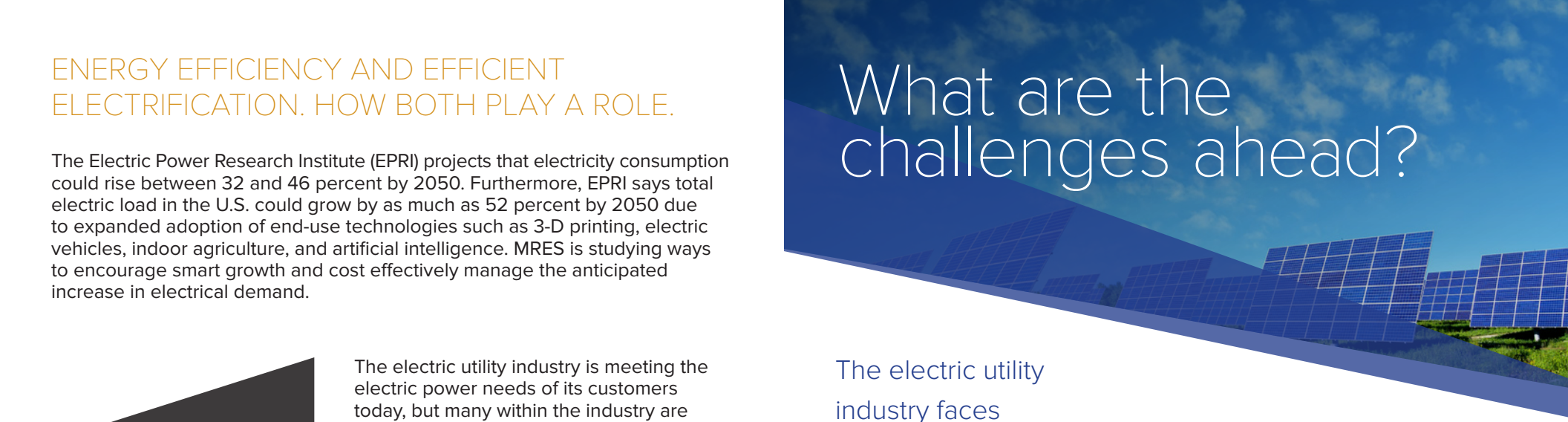
ENERGY CONSERVATION VS. ENERGY EFFICIENCY

CONSERVATION = Cutting back or reducing the electricity you use simply by using equipment less. Some conservation methods can reduce productivity, while others, such as turning down thermostats, can affect comfort.

EFFICIENCY = Using a new technology or new piece of equipment that uses less energy because of technological advances such as replacing incandescent light bulbs with energy-saving fluorescent or LED bulbs.

The electric utility industry is meeting the electric power needs of its customers today, but many within the industry are playing a more active and aggressive role in helping those customers find ways to save energy and control their energy costs. New resource development is important to meet changing customer expectations, but we also know that efficient use of energy is a resource in its own right.

MRES, since 2008, has actively encouraged energy efficiency through its Bright Energy Solutions® rebate program, which is administered through its 61 member communities.



What are the challenges ahead?

The electric utility industry faces a wide range of challenges as it tries to ensure that people and businesses have the electricity they need at a price they can afford.

Among those challenges are ever-increasing concerns about climate change and greenhouse gases, aging and increasingly inadequate transmission, volatility of fuel and construction costs, shortage of qualified labor, regulatory compliance, state and federal renewable energy objectives and standards, ever more complicated rules and requirements of MISO and SPP, and the cost and lengthy process for gaining regulatory approvals for generation and transmission projects.

Growth in renewable resources such as wind and solar energy continues and brings another set of challenges for the electric utility industry. Most types of renewable resources are lacking in reliability (example: wind turbines do not produce energy when the wind is not blowing). Therefore, these resources require backup power supplies, often natural gas-fired generation, to ensure that customers have the electricity they need when they need it. While some utilities are looking at storage as backup, that also comes with challenges, including cost, wear and tear on the facility, timing, battery charging and discharging, supplying power quality, and supplying large amounts of power for industrial and commercial customers.

There also is a growing interest among customers in installing their own generating units including small wind turbines or solar panels. These technologies are known as ***distributed generation.*** Utilities need to take such technologies into account when they are planning for reliability, SPP/MISO power balancing, power quality, physical security, safety, and cyber security.

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