Straight Talk about Renewable Energy Sources

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Some readers of this article may be old enough to recall the energy crisis of 1973, which included major gasoline shortages and long lines at gas stations. At the time, Congress and the ensuing Carter administration thought the answer to the oil embargo was to move the American energy system to renewable sources. In 1978, the Public Utilities Regulatory Policies Act (PURPA) was passed to promote greater use of renewable energy. In part, PURPA required electric utilities to buy renewable power from non-utility sources. South Mississippi Electric has one such agreement with Leaf River Energy in New Augusta. That facility and our hydropower contracts constitute our "green power" resources, which make up about two percent of South Mississippi Electric's total energy delivered to its Members.

In the past three decades, national leaders have tried to further encourage the development of renewable energy. The usual stimulus is a subsidy in the form of a tax credit, with the goal of enabling renewable power sources to compete economically with traditional power generation facilities. Early on, the thought was that these subsidies would "prime the pump," so that as wind and solar production increased, their cost would go down and renewables would be financially competitive with conventional, large-scale generation resources.

The reality is that despite 30 years of subsidies and political encouragement, conventional energy sources are still much more economical and reliable than renewable energy sources. This is especially true here in the Southeast, where we do not have wind patterns with sufficient speed and duration needed for wind turbine operation. Consistent solar production is also limited in our region due to frequent rain and cloud cover. Biomass-fueled generation does exist to a small degree and has some potential for growth, but it is significantly more expensive than existing power resources and cannot match the scale required to meet the around-the-clock needs of hundreds of thousands of customers. So even if renewable generating resources were available and reliable, there are limits to what can be achieved in South Mississippi, unless customers are willing to pay much more for electric service.

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I will readily admit that developing renewable sources is a good idea, but any steps we take toward that end must be balanced with cost and reliability considerations. In a recent survey, electric consumers in Mississippi told us that they do not want higher costs. Meanwhile, demand for electricity is growing here and throughout the nation, so that even if we want to increase the 2% of electricity generated by renewables other than hydropower, we still must move forward with other sources. (Because of their intermittent nature, renewable sources require additional sources of consistent generation for back-up purposes.) Low-cost coal is currently the basis of nearly 50% of the electricity generated in our country. Nearly 50 new nuclear plants will be required just to maintain the current level of the country's output from that source (roughly 20%).

We believe that it is important to try to help find solutions. We have joined the National Renewables Cooperative Organization (NRCO), a non-profit association formed by generation and transmission co-ops like South Mississippi Electric from across the country. I was elected to the Board of Directors and also serve as treasurer and chairman of the Finance Committee. NRCO's goal is to investigate and develop cost-effective renewable energy projects, and we have selected a CEO and an energy firm to begin screening projects. (See more about NRCO on page 4 of this insert.)

This debate is not just about energy; it is about peoples' lives and the importance of energy to individuals and families. While we would welcome the sun and wind becoming viable fuel sources—as we would not have to worry about contracts for fuel supplies, fuel transportation, and hedging the market risk of fuel prices—the economic reality is that we cannot substitute renewables today for our present generation resources. You expect us to keep the lights on, and keeping our rates affordable and our service reliable in these difficult times is our number one job.

News Co-op Members Need to Know

This is the fifth of a series of informational inserts to help members understand the many issues that affect their electric power supply. South Mississippi Electric produces and delivers the electricity that its eleven member-owner cooperatives provide to their consumers. Together, our responsibility is to deliver reliable, not-for-profit electric service to more than 400,000 homes and businesses in 56 Mississippi counties. Every day—as a system—we work to demonstrate The Power of Twelve.

The Power of 12

SOUTH MISSISSIPPI ELECTRIC

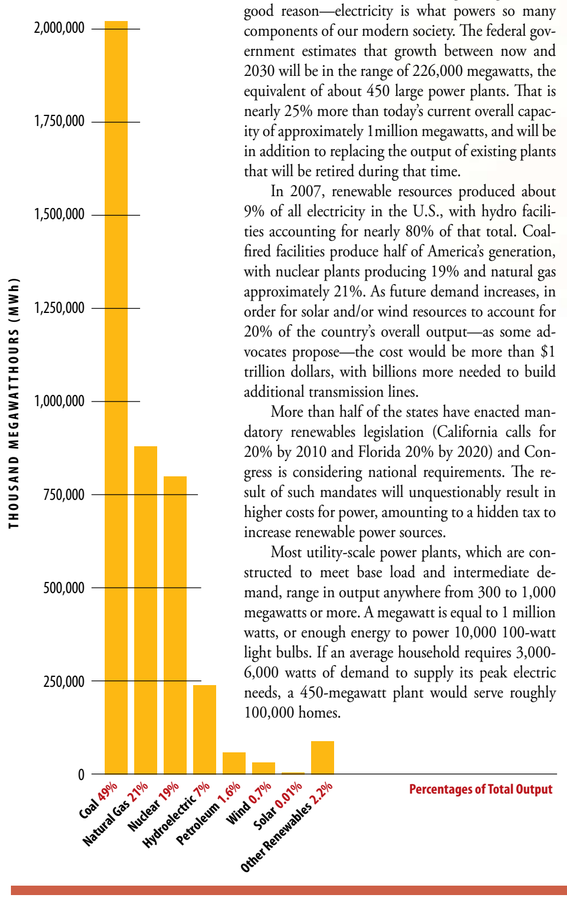
GROWING MISSISSIPPI

America is on the brink of an energy crisis. The electric industry is facing challenges not seen in decades. New generating plants must be built to meet increasing usage, and there must be a balance between finding new sources, maintaining low costs and providing reliable service.

In recent months, there has been wide-ranging debate about expanding the country's renewable resources, which may ultimately prove to be worthwhile. However, it is important to understand the actual scale of electric usage and production in the United States, as well as the limited role renewables can play in meeting the country's overall demand, both near- and long-term. It is also important to understand the costs associated with producing electricity, how expensive renewable sources will be, and that the massive costs to develop renewables will be passed on to consumers.

Without question, the U.S. needs to expand the use of renewable energy. However, the discussion and media coverage about how renewables can help meet the country's overall energy needs has often been incomplete, inaccurate and, at times, misleading. Frankly, it is unrealistic to believe that America can totally replace major parts of its current power delivery system without jeopardizing reliability and significantly increasing costs.

U.S. Electric Generation by Fuel Source, 2007



Americans' thirst for electricity is growing, and for good reason—electricity is what powers so many components of our modern society. The federal government estimates that growth between now and 2030 will be in the range of 226,000 megawatts, the equivalent of about 450 large power plants. That is nearly 25% more than today's current overall capacity of approximately 1million megawatts, and will be in addition to replacing the output of existing plants that will be retired during that time.

In 2007, renewable resources produced about 9% of all electricity in the U.S., with hydro facilities accounting for nearly 80% of that total. Coal-fired facilities produce half of America's generation, with nuclear plants producing 19% and natural gas approximately 21%. As future demand increases, in order for solar and/or wind resources to account for 20% of the country's overall output—as some advocates propose—the cost would be more than $1 trillion dollars, with billions more needed to build additional transmission lines.

More than half of the states have enacted mandatory renewables legislation (California calls for 20% by 2010 and Florida 20% by 2020) and Congress is considering national requirements. The result of such mandates will unquestionably result in higher costs for power, amounting to a hidden tax to increase renewable power sources.

Most utility-scale power plants, which are constructed to meet base load and intermediate demand, range in output anywhere from 300 to 1,000 megawatts or more. A megawatt is equal to 1 million watts, or enough energy to power 10,000 100-watt light bulbs. If an average household requires 3,000-6,000 watts of demand to supply its peak electric needs, a 450-megawatt plant would serve roughly 100,000 homes.

Generation Required to Meet Consumer Demand

The demand for electricity varies from moment to moment with changes in business, industrial and residential activity, as well as the weather. Consumer usage in the summer normally begins growing in the morning, peaks in the early afternoon and bottoms out in the late evening and early morning. (See chart at right.)

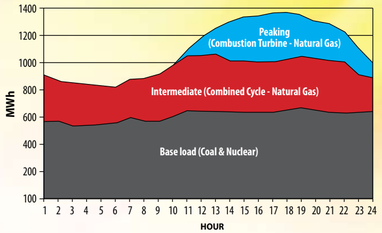
The generating units available to meet system load are "dispatched" (placed on-line) in order of lowest operating costs and highest reliability. This is referred to as the "economic dispatch" of a power system's plants.

Nuclear and coal-fired base load units, which are expensive to build but have low operating costs, are the country's workhorse units. Other than for planned and forced maintenance, these generators normally run throughout the year.

Combined cycle units, which are very efficient but use more expensive natural gas as a fuel, are used to meet intermediate load. These cycling plants can ramp up and down during the day and may be started and shut down on a daily basis.

Peaking plants are usually less efficient and burn natural gas. They run only as needed to meet the highest load demands. In addition, U.S. utilities are required to have reserve capacity equal to at least 15% more than their system's highest projected demand.

Power systems must meet actual usage on their system at all times, but renewable power sources can only be used to help meet demand when they are available. Renewable sources, such as wind turbines and solar panels, do not have firm levels of output because they are dependent on the weather—there is no guarantee that they can generate at a specific load level at a given point in time.



Base load generation - *"Base load" generating units, which have low variable operating costs, are used to meet the continual demand for electricity that occurs throughout the day. Base load units can also meet some of the demand above the base requirements, and their output can be reduced when demand is unusually low.*

Intermediate generation - *The greater part of the daily up-and-down swings in demand are met with "intermediate" or "load-following" generating units. These units can quickly change their output to match the change in demand (that is, they have a fast "ramp rate"). Load-following plants can also serve as "spinning reserve" units that are running but not putting power on the grid, so they are immediately available to meet unanticipated increases in load or to back up other units that go off-line due to breakdowns.*

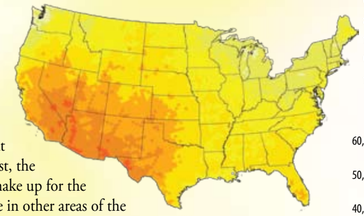
Peaking generation - *The highest daily load requirements are met with "peaking" units, which are typically the most expensive to operate but can quickly start up and shut down to meet peaks in demand. Peaking units serve as "quick start" units, and are able to go from shutdown to full load in minutes. A peaking unit usually operates for only a few hundred hours a year.*

What is Renewable Energy?

Renewable energy resources are potentially inexhaustible in duration but limited in availability. The primary focus in the U.S. on developing renewable energy resources includes wind, solar, hydropower, biomass and geothermal. In 1850, about 90% of the energy consumed in the United States was from renewable energy resources. As the demand for energy grew exponentially, more reliable sources were developed. Today the country relies primarily on fossil fuels and nuclear to generate electricity.

Solar Energy

Solar energy systems use the sun's radiation to produce heat and electricity. In 2004, 90% of solar energy consumed (less than 1% of U.S. energy output) was used for heat. Although it may seem that sunlight is plentiful in the Southeast, the sun's intensity is not sufficient to make up for the lack of solar panel efficiency, unlike in other areas of the country, such as the Southwest.



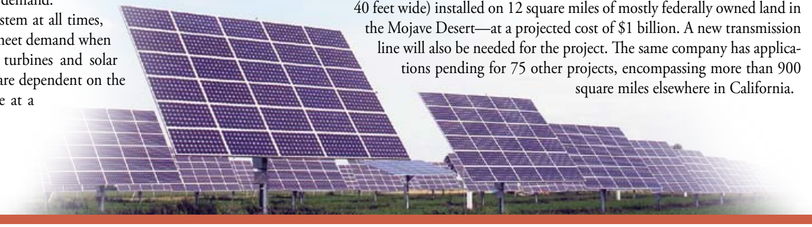
Photovoltaic Systems – Photovoltaic (PV) systems are based on solar electric cells, which convert solar radiation directly into electricity. Individual PV cells are configured into modules of varying electricity producing capacities. Some photovoltaic systems are integrated into building components like roof shingles or glass. The electric power generated is typically a small amount, usually consumed inside a home or business. Any excess power can possibly be delivered to the electric grid in conjunction with an interconnection agreement with an electric provider.

Installing a residential photovoltaic system is still not competitive with conventional electric service, even though power costs are rising. It would require more than 30 years for a residential consumer in the Southeast to recoup the cost of installing a 3-kilowatt system, which is longer than the effective life of the system. The total installed cost is estimated at $9 per installed watt, or $27,000 (Federal tax credits or other incentives may reduce that cost slightly).

Solar Thermal Systems for Heating Buildings and Water – Solar thermal collectors usually do not generate electricity in today's residential setting. Collectors, such as solar water heaters, simply capture the sun's heat inside a flat rectangular roof plate. The heat is directed to water for use inside the home or a pool. Solar heat usually replaces around 60% of the typical water heater energy.

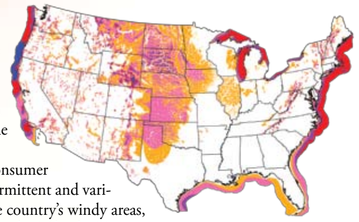
Solar Thermal-Electric Power Plants – Solar thermal-electric power plants use concentrating solar collectors to focus the sun's rays to heat fluid to a high temperature. This working fluid can then be used to generate steam to operate a turbine, which is then used to produce electricity in a generator. An advantage of larger-scale solar sources is that they would typically follow a normal load curve throughout the day, depending on cloud conditions.

In California, where large solar facilities may be more feasible, the state has imposed a mandate that power companies produce 20% of their energy from renewable sources by 2010. One 850-megawatt project announced by an independent power producer will use 34,000 solar collection panels (each 38 feet tall and 40 feet wide) installed on 12 square miles of mostly federally owned land in the Mojave Desert—at a projected cost of $1 billion. A new transmission line will also be needed for the project. The same company has applications pending for 75 other projects, encompassing more than 900 square miles elsewhere in California.



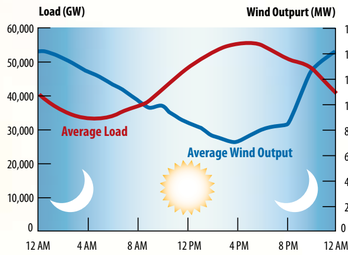
Transmission access to large wind- and solar-producing areas will also need to be addressed. The North American Electric Reliability Corporation (NERC), charged with overseeing the country's electric reliability, issued a report in November 2008 suggesting that the national transmission grid will require a new system to allow power to move from the geographic locations that support renewable energy facilities, especially wind and solar, to areas where the power is needed. Those costs will be passed along to consumers.

Wind Energy



Several regions in the United States have persistent and strong winds much of the year, but the Southeast is not so fortunate. The best wind resources are in the Great Plains, the Northwest and some portions of the Northeast.

The main issue for reliably serving consumer demand with wind generation is the intermittent and variable nature of wind patterns. Even in the country's windy areas, the wind does not blow all of the time and wind velocities vary. Overall, wind turbines are available only 20% to 40% of the time, which means that roughly three times the number of facilities must be installed to achieve a desired output.

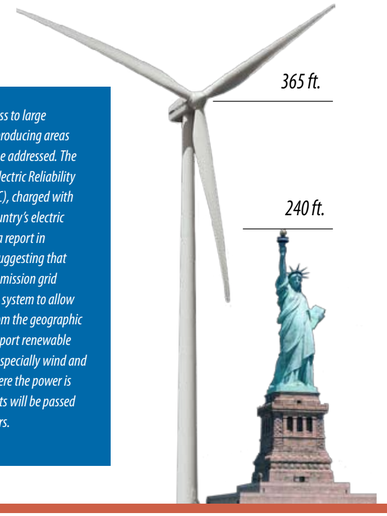


Average 24-Hour Wind Output in Texas (August)

Availability – Typically, wind speeds decrease during the hotter parts of a day and during the summer months, further decreasing the available output of wind sources as electric loads rise.

Fluctuating winds and availability can also cause serious reliability concerns. If conventional power plants are not available to meet firm demand, then sudden drops in wind production could cause regional blackouts. On Feb. 26, 2008, the Texas grid experienced a stage-two emergency because the planned availability of conventional generating units was low, consumer demand increased unexpectedly, and wind generation suddenly dropped from 1,700 megawatts to 300 megawatts. The emergency required 1,100 megawatts of industrial load to be dropped within 10 minutes.

The reliability of wind generation sources can be helped at some point by linking the units to massive electricity storage facilities, but with current technology, storage options are limited and prohibitively expensive. Without large-scale storage, wind generation requires back-up generation (mainly powered by natural gas) to be on-line to fill in the gaps, which means additional base load and intermediate facilities will still need to be built to meet growing demand.



The largest modern wind generators, which are roughly 365 feet tall with blades 270 feet in diameter, are each rated at 1.5 to 2 megawatts. A Texas wind farm project with a capacity of 4,000 megawatts, announced in 2008, will cost $10 billion to build and will require 400,000 acres (625 square miles). By comparison, a nuclear plant would cost about half that amount and provide nearly the same output—around the clock and probably for most of the year. The U.S. Department of Energy estimates that nearly 200,000 wind turbines would be needed to increase the country's current 1% reliance on wind-produced electricity to 20%.

Other Types of Renewable Energy

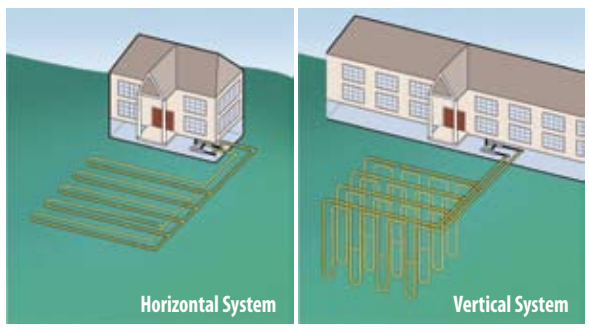
Biomass

Biomass energy is produced from non-fossilized materials derived from plants and organic material. Wood and wood waste are the largest sources of biomass energy, followed by energy from municipal solid waste, mostly in the form of methane gas produced by decomposition of the waste.

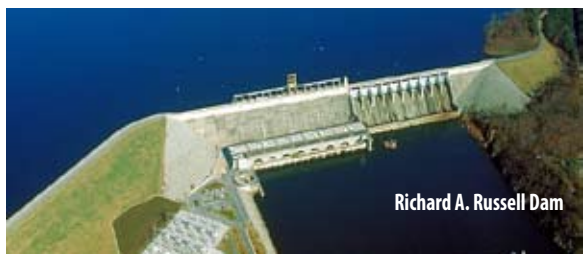
Geothermal

Geothermal energy is energy from the hot interior of the Earth. Fissures in the Earth's crust allow water heated by geothermal energy to rise naturally to the surface at hot springs and geysers. In the western U.S., deep wells allow heated steam or water to escape to the surface in a controlled manner to operate steam turbines and electricity generators.

In a different type of application, the consistent temperature of the Earth or ground water can be used as a heat source and sink for geothermal heat pumps that heat and cool buildings. Geothermal heat pump systems are sometimes called geoexchange systems, ground-source heat pumps, water-source heat pumps, or Earth-coupled heat pumps. According to the U S. Department of Energy, geothermal systems may reduce heating and cooling costs by 44% when compared to air-source heat pumps and by 72% compared to an electric resistance heating system with a standard air conditioner. In the Southeast, the payback period for the higher installation costs of a residential geothermal unit compared to a comparable air-to-air heat pump may be from 10-12 years.



Hydropower



Hydropower is electricity produced from flowing water. As a result, hydropower output varies widely according to rainfall. Most hydropower is produced at large facilities built by the federal government, such as Grand Coulee Dam on the Columbia River in Washington State—the largest single electric power facility in the United States. Most of the largest dams are located on rivers in the western United States, but numerous smaller facilities operate around the country. Few opportunities exist for building new large-scale hydroelectric facilities, and existing facilities will not be considered as renewable sources under new mandates which are being discussed.

The newest "wave" in hydropower technologies is being developed to harness the energy in ocean tides, waves, and currents. Several companies have received preliminary federal permits to develop projects for "underwater windmills" that would tap river currents, though output would be minimal.

Energy Efficiency

Offsetting electric usage may be one of the most effective ways to help address the nation's energy issues. Not-for-profit electric cooperatives have a long history of helping their members use energy wisely.

The application of new technology for appliances, heating and cooling systems, and lighting for homes and businesses can help reduce usage and costs for nearly all consumers.

For example, 63% of the 7 billion light bulbs in the U.S. are incandescent, which produce only 10% of their energy as light. The remaining 90% is given off as heat, which also affects heating and cooling requirements. Compact fluorescent lamps (CFLs) use only one quarter of the energy of comparable incandescent bulbs.

Programmable thermostats can help precisely control heating and cooling levels that reflect the usage patterns of homeowners. Other load-reduction technology is being adopted to be implemented through "smart" meters so that power providers can remotely control service to customers during peak times of use.

Many other energy savings tips can be found at your Electric Power Association's Web site or at www.smepa.coop.

National Renewables Cooperative Organization

South Mississippi Electric (SME) and its Members are founding members of the National Renewables Cooperative Organization (NRCO), a new organization formed last April by power supply cooperatives located across the country. SME General Manager/CEO Jim Compton is treasurer of the organization and chairman of the Finance Committee.

The organization's goals are to assist cooperatives nationwide in their efforts to develop new, economically viable renewable energy resources, while also enhancing the use of renewable technology that is currently available. Electric cooperatives across the country are now in the process of establishing a variety of renewable energy requirements and goals, and the new organization plans to help with research and development.

NRCO℠
NATIONAL RENEWABLES COOPERATIVE ORGANIZATION

"At this point, it is difficult to pin down exactly how best to develop renewable resources because what works in one area of the country may not work in another area," says Compton. "This cooperative effort will help identify the best possible resources and assist with a coordinated plan to bring them on-line. We hope to identify renewable projects for Mississippi and our region. Co-ops of every size will participate, and we want to ensure that they can do so affordably and without unnecessary risks and duplication."

NRCO has already hired a CEO and an energy management company that will coordinate resources, expertise and research efforts needed to identify and evaluate renewable opportunities and projects. Several states have already adopted required renewable standards for utilities. Some national legislative initiatives are also considering making renewable sources mandatory components of any future energy policies.

"There is much to be explored regarding renewables," Compton adds. "At this point, the demand required to keep up with ever-increasing customer growth far exceeds the potential for renewable sources, but every new source is important because the needs are so great. We want to find options that will be a good fit on the not-for-profit side of the electric industry, as well as what is beneficial for our Members, if national standards for renewables are enacted."

Sources of information for this edition: *U.S. Energy Information Agency; Congressional Research Service Report to Congress (November 2008), Power Plants: Characteristics and Costs; Electric Utility Week; National Renewable Energy Laboratory; Nuclear Energy Institute; Electric Reliability Council of Texas; Electric Power Research Institute.*