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# Alternative and Renewable Energy Solutions

Clean, Reliable Options Today for a Sustainable Future

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(12/11, Part# 153-732P10)

Answers for infrastructure.



# Renewable and alternative energy sources are environmentally friendly and can be emission free

Regenerative energy sources such as solar, wind, biomass and biogas are essential for sustainable, climate-compatible power generation. As demand for fuel increases worldwide, alternative and renewable energy sources are emerging as economical, dependable options to traditional oil-based and coal-based fossil fuels.

While these innovative sources of energy have enormous potential, they require special knowledge — knowledge that Siemens experts have to help you identify and implement new green opportunities.

## What Siemens Can Do For You?

Siemens will tailor an energy program using advanced technologies in alternative and renewable fuels to meet your budget and your sustainability goals. Our solutions and technologies are designed, developed and implemented locally, by people in your community with environmental responsibility in mind.

## Siemens will provide you with:

- Beginning-to-end project engineering, design and construction
- Expertise in capturing, measuring and marketing greenhouse gas emissions
- Regulatory and environmental compliance assistance
- Continual operations and maintenance support
- Assistance in community relations efforts
- Innovative performance-based financing

While we are continuously seeking and researching new technologies to solve future energy challenges, Siemens currently concentrates its efforts in:

- Solar
- Biogas (Landfill and Wastewater Treatment)
- Biomass (Wood and Waste-to-Energy)
- Small Wind

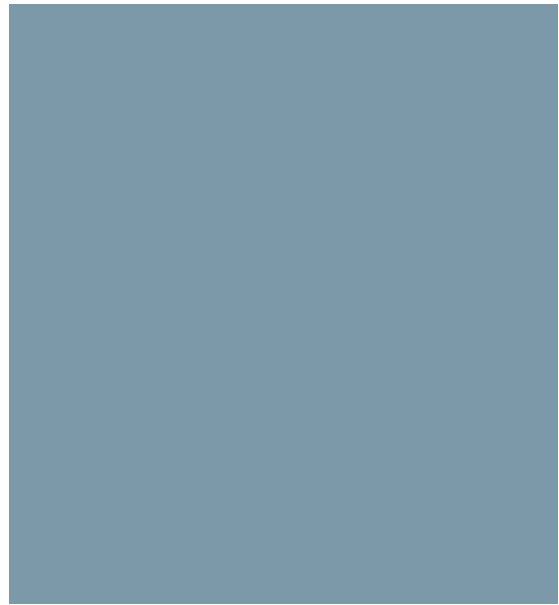
## Alternative vs. Renewable: Is there a Difference?

What is the difference between alternative energy and renewable energy? What value can each provide to your business?

**Alternative Energy** is the “unharnessed energy” of waste. Whether it be methane from landfills or wastewater from treatment plants, this “left over” output can be converted into usable energy sources. The fuel stream created by the waste does not consume any new natural resources or harm the environment.

**Renewable Energy** is fuel generated by sources that are readily replenished and available in nature. Solar rays, wind velocity and biomass material are all examples of renewable resources that can be converted into usable energy.





## Solar Energy

Solar energy is the planet's most abundant renewable energy resource. The Earth receives more energy from the sun in one hour than the entire world consumes in a year. But how do you capture and convert that energy to power your facility?

There are two types of solar energy technology: solar electric technology and solar thermal technology. Solar electricity uses photovoltaic (PV) cells in panels to generate electricity, while solar thermal uses the sun to heat water or fluids in collectors.

### Solar Electricity (Photovoltaics)

Photovoltaic energy converts photons of light into electricity through a photovoltaic cell. A PV cell is a semiconductor device that converts solar radiation into direct current electricity. Individual PV cells are the basic building blocks for modules, which in turn are used for solar arrays and complete PV systems.

### Solar Thermal

Solar thermal energy uses solar collectors to gather the sun's energy and transform its radiation into heat for water, solar fluid or air. Solar thermal energy can be used in solar water-heating systems, solar pool heaters and solar space heating or cooling systems.

#### Benefits of Solar Energy:

- Access to federal, state and local grants and incentives
- Energy security
- On-site fuel source
- Renewable energy certificates
- Energy price stability
- A reduced carbon footprint
- Commitment to renewable energy

### Implementing Solar Energy

Siemens offers a Power Purchase Agreement (PPA) that allows customers to implement clean solar energy projects without making an initial capital investment in solar equipment. Please see the "Financing Renewable and Alternative Energy Projects" section to learn more.

## Biogas

### Landfill Gas Technology

Landfill gas systems harness gas emitted from waste sites, so that it can be converted into a power source or used as fuel replacement.

Landfill gas (LFG) is created by decomposing solid waste. The methane released during decomposition can be captured, harvested and converted into a significant energy resource. Methane emissions are some of the most potent greenhouse gases. The collection and use of LFG reduces not only landfill odors, but prevents methane and other harmful emissions from entering the atmosphere.

#### The Benefits of Landfill Gas

An asset for municipalities, counties or private owners, methane can provide:

- New revenue streams
- Energy price stability
- A stable on-site fuel source
- A reduced carbon footprint

### Digester Gas Technology

Specifically for wastewater treatment plants, digester gas technology uses bacteria to purify water and in the process, creates energy.

This biological treatment uses anaerobic microorganisms in an oxygen-free environment to feed on the organic materials in sludge. As the bacteria digest waste, they create a methane gas by-product which, when captured, can be used as a fuel substitute.

Together with Siemens Water Technologies, we can help you efficiently capture and utilize this renewable energy source that can be used as an on-site, alternative fuel.

#### The Benefits of Digester Gas

- Energy price stability
- Energy security
- A reduced carbon footprint
- Commitment to renewable energy



## Biomass

### Wood Biomass Gasification Technology

The wood gasification process thermally converts waste material into a new energy source.

Wood biomass gasification heats wood in an oxygen-deprived environment until the wood is transformed into a gas. The resulting gas can be used to power on-site energy systems and can be used like other fuels, to create hot water and steam, or cooled and purified to be used as fuel for engines, gas or microturbines.

The advantage of biomass gasification is that waste wood is not put into the landfill — leaving room for other materials that are not reusable. Subsequently, the wood is processed into a usable fuel source that emits a low amount of pollutants, such as Nitrogen Oxides (NOx) during the conversion.

#### The Benefits of Wood Gasification

- Energy price stability
- Direct use as on-site energy
- Cleaner emissions
- Energy security

## Small Wind Technology

Wind power is expanding across the country and is a clean, renewable energy source. Small wind technology uses turbines and their blades to “capture” the kinetic energy generated by the wind. The motion of the spinning or rotating blade is converted into electricity that powers a generator. Rotors typically have two or three blades and the number and size of the blades is what determines the amount of wind caught up in the “swept area” of a turbine. Typically, a tail is used to keep the turbine facing the correct direction to capture the wind.

Small wind can be used to demonstrate your organization’s commitment to renewable energy while serving as an on-site, back-up energy source.

#### The Benefits of Small Wind

- Demonstrates commitment to renewable energy
- Direct use as on-site energy
- A reduced carbon footprint

## Financing Renewable and Alternative Energy Projects

### Performance-Based Solutions

With specific renewable and alternative energy projects in mind, a guaranteed performance-based solution can help align an organization’s sustainability mission with the realities of existing infrastructure.

Siemens guarantee ensures energy consumption savings throughout the contract period. If the agreed upon energy goals are not met, Siemens pays the deficit. If your energy savings surpass the Guarantee goals, you receive 100 percent of the excess savings – an unbeatable formula for our customers.

### Other Available Financing Options

#### Federal Tax Credits

Renewable energy systems give building owners access to a variety of incentives and subsidies. In addition, many states and utilities currently have specific solar incentives available for system owners to sell electricity to the grid or use it for net metering. As a further benefit, the environmental attributes of a PV system — the Renewable Energy Credits (RECs) — can be separated and sold.

#### Siemens Power Purchase Agreement (PPA)

Because public sector companies are tax-exempt, they are unable to take advantage of federal tax credits available for solar energy projects, potentially making these projects cost-prohibitive. With a Siemens Power Purchase Agreement (PPA), financing solar projects can be more cost effective. This program allows customers to procure solar power from Siemens, with equipment that Siemens makes, builds, maintains and owns. Solar power is purchased from Siemens at a competitive price per kilowatt hour, paying only for the power that is generated on their property. Customers who take advantage of Siemens Solar PPA will eliminate the separate third-party financing and contractual agreements that are requirements of other companies’ PPA structures.

## Siemens Building Technologies Division

At Siemens, we feel it is important to leave an intact world for future generations. Throughout the building life cycle — from new construction, to facility management, to infrastructure renewal — green buildings require a strategic approach to building performance and reduced environmental impact.

As a leading provider of energy and environmental solutions, building automation and control technologies, fire safety and security system solutions, Siemens Building Technologies Division makes buildings comfortable, safe, productive and less costly to operate. In conjunction with our sister companies, Siemens Water Technologies, OSRAM/SYLVANIA, Siemens Power Generation and Siemens Energy and Automation, Siemens Building Technologies Division can fulfill your facilities’ overall energy and environmental needs.

As part of an international corporation, Siemens Building Technologies Division is able to provide world-class solutions in conjunction with local support. Each of our offices is a full-service branch staffed by sales professionals, on-site technical service specialists and project management teams that deliver complete building solutions. Siemens is constantly seeking and researching new and better technologies to solve our future energy challenges.

