RENEWABLE ENERGY
Energizing innovation in wind, solar, water, and biogas – worldwide
According to two recent reports on renewable energy trends in 2011, the industry is on the grow, despite a shaky world economy.

- Global renewable energy investment was at a record $257 billion. Parker’s investment in renewable energy research and development (R&D) has also grown every year.

- Solar generation surged past wind power to become the renewable energy technology of choice for global investors. Parker offers solutions for solar panel manufacturing, motion and control technologies such as pitch actuators, as well as energy extraction, power conversion and cooling, and energy storage.

- In 2011, renewable energy technologies continued to expand into new markets: around 50 countries installed wind power capacity. From blade pitch systems, shaft and yaw brake systems, filtration and connectors, to advanced cooling and power conversion systems, Parker solutions in wind deliver reliable performance and unsurpassed quality.

- Hydroelectric power continues to grow globally, with some projections estimating that global hydropower production could double between now and 2050. Parker’s global hydraulic, connector, and filtration capabilities will provide significant growth opportunities.

- Alternative energy technologies continue to be developed. Parker is working with customers to develop offshore wave power systems using a combination of our variable-speed drive and hydraulic technologies.

- Although Europe dominates biogas production, the trend is also catching up fast in countries like Japan, Australia, New Zealand, and the U.S. With decades of experience in gas treatment installations, Parker continues to develop hydraulic, pneumatic, and electromechanical systems that deliver optimal results for biogas plant developers. Our significant portfolio of products and systems for biogas production increases methane content and improves the quality of fuel produced, maximizing revenue for plant owners.
Reduced Time to Market • Global Support

From concept through production, our ability to design, prototype, and manufacture worldwide will shorten your design cycle, improve production efficiency, and simplify procurement procedures.

• Parker engineers and scientists provide valuable, early-on collaboration for production optimized design and streamlined development.
• In-house tooling and manufacturing capabilities facilitate rapid prototyping.
• Advanced manufacturing quality systems are utilized to ensure products meet leading quality standards.

These capabilities guarantee you the greatest reliability and the most competitive total cost of ownership for your renewable energy systems.

Global expertise

Renewable energy is a key market-focused business unit for Parker. As such, Parker continues to invest heavily into the sector. With a dedicated global team of renewable experts drawn from multiple Parker divisions, the business unit leverages the power of Parker, offering cross-technology innovations and cross-market competencies to help drive down the cost of construction, maintenance, and operation while increasing engineered system innovation.

A multiple technology provider

Proven solutions in advanced motion and climate control, filtration and condition monitoring, hydraulic and pneumatic management, actuation, instrumentation, motors and drive technology, and sealing and shielding give you a wealth of integrated, multi-technology systems, sub-assemblies, and components engineered to work together, producing a far more efficient and reliable energy generation system.

Selective levels of integration • Fewer suppliers

When it comes to suppliers in renewable energy, you want fewer companies with more capability. Our selectable levels of integration – which include components, sub-assemblies, and integrated systems – give you plenty of options, saving you time and money by reducing the need for multiple suppliers, lowering development cost and speeding time to market.

A condition monitoring early warning system that incorporates an icountPDR – a robust Particle Detector. Parker EWS is designed to independently monitor system contamination trends and ultimately help protect hydraulic systems.

Services and support

Our approach to customer service and support is as innovative as our renewable technologies, making your workday more productive as we reduce your hidden costs and improve your profitability with the following:

- 13,000 distributors, sales offices, and maintenance, repair and overhaul (MRO) outlets – Instant access to parts, products, maintenance, service, and solutions.
- ParkerStores – Your local source for hose assemblies, hydraulics, pneumatics, filtration, and more – around the corner and around the world.
- ParkerStore On-site Containers – A transportable workshop providing on-site maintenance and product support.
- HOSE DOCTOR® – Emergency mobile hose repair and replacement in the field.
- Kitting – Multiple components in a customized kit with a single part number for easier order processing and assembly.
- Piping Solution Center – Global service centers offering single-source, non-welded piping solutions including consultation, design, assemblies, and installation.
- Training – Customized training sessions with qualified instructors.
- Renewable Center of Excellence – A global resource organizing and communicating best-in-class engineering practices for all renewable markets.
- Parker Tracking System (PTS) – Bar code identification labeling system helps you identify and order replacement custom hose assemblies faster.

Global and local

Your language, your time zone, your currency. No matter where you develop, assemble, manufacture or install, Parker is there. By working with us, you have access to an integrated network of global manufacturing plants, distributors, sales and service offices in every major country.

National and international certifications

National and international certifications verify that our systems and solutions offer the highest possible quality for the most efficient performance in even the most challenging environments.
Harnessing the wind: Onshore and offshore

Parker has been on the forefront of wind power for over two decades, with solutions that touch virtually every critical function in the turbine. From integrated lube oil filtration systems and sealing technologies that make drive trains more reliable and bearings operate like new ... to compact blade pitch actuation systems that maximize rotor efficiency and minimize vibrations in the turbine ... Parker has the solutions that make today’s advanced and sophisticated wind power plants better and smarter. Case in point? Our high efficiency power conversion systems that deliver optimum power to the grid. While our scalable evaporative cooling system lowers overall system cost with up to 40% higher power throughput.

Two-phase evaporative cooling

Ideal for modern multi-megawatt wind turbines that utilize complex power electronics for grid frequency and power factor control, Parker’s two-phase evaporative cooling takes the performance of the power modules to a whole new level. With a rack-integrated design, the cooling system offers a multitude of benefits over traditional air or water-based cooling systems deployed today. These include:

- Increased power output of up to 40% from the same system with conventional cooling
- Virtually maintenance free – no filter, water, valves, bulb replacement
- Hermetically sealed and non-conductive – safer for electrical systems and service technicians
- Up to 50% more energy efficient
- Flexibility to mount in the nacelle or at tower base (inside or outside)

Driving power conversion

The Energy Grid Tie Division at Parker designs and manufactures state-of-the-art power converters and inverters for the renewable energy industry. These systems are critical to delivering clean, high quality, and compliant electrical energy to the transmission grid from variable power sources such as wind turbines, solar photovoltaic (PV) and solar concentrated photovoltaic (CPV) installations, as well as from storage reserves such as battery energy storage systems. Parker’s power conversion systems also play a critical role in grid stabilization as a higher percentage of renewable energy sources are integrated into the grid and demand loads vary constantly. In addition, these systems can provide kilovolt-ampere reactive (kVAR) compensation for optimization of power factor.
Look to Parker for:

- Integrated solutions that improve wind turbine reliability and performance

**Nacelle auxiliary systems**
- Blade and rotor
- Gearbox and generator

**Parker has product and system solutions**
- Hydraulic hose and fittings
- Steel and seals
- Electromagnetic interference (EMI) shielding and coatings
- Thermal management solutions:
  - Two-phase evaporative cooling

**Fluid connector solutions**
- Tube fittings, hydraulic hose and fittings, steel and stainless steel quick couplings, non-welded tube connections

**Parker's products** to ensure optimum integration and in-field test custom designs.

**Functional application areas**
- Gearbox and generator
- Blade and rotor
- Nacelle auxiliary systems

**Condition monitoring system**
- A combination of fluid, vibration, and acoustic sensors, working with a data acquisition system and software, provides a cost-effective solution for monitoring the health of the wind turbine and predicting maintenance requirements.

**Heat exchangers**
- Parker's technology is based on very large thermal exchanges for its energy recovery market. Parker's heat exchangers meet international performance and design standards. Parker's heat exchangers have high thermal conductivity and provide high efficiency with low pressure drops.

**Parker's products** are designed specifically for wind turbines, providing optimal performance and reliability in wind turbine applications.

**Parker's ParFit® hydraulic and lube oil filters** are designed for optimum performance and reliability in wind turbines.

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Advanced systems for photovoltaic (PV) and concentrated solar power (CSP) methodologies

Solar power is the most plentiful source of energy on the planet. Light from the sun can be directly converted to electricity via PV cells or by using mirrors or lenses to concentrate sunlight to a central receiver (CSP). Parker provides advanced systems that can be used in both methods of solar power. Our solutions include megawatt scale solar inverters and hydraulic motion systems for both PV and CSP, as well as engineered sealing solutions, thermal management solutions, and the most complete line of fluid connectors in the world. In addition, we offer established manufacturing and supply chain expertise to support large projects like solar fields. If you are designing or planning to build a solar field, Parker can provide customized solutions that will help you optimize your return on investment.

Outdoor-rated, utility scale solar power inverters are best-in-class

Long a trusted supplier of advanced electrical power conversion systems and a pioneer in utility scale energy storage systems, Parker has developed an advanced, megawatt-class PV solar inverter utilizing the company’s cutting-edge precision cooling system (PCS) technology. The marriage of advanced cooling and sophisticated electronic design results in best-in-class efficiency, a smaller physical envelope than that of our competitors, and a completely sealed system ideal for desert environments. Parker solar inverters also incorporate maximum power-point tracking (MPPT) and fault handling capabilities to maximize availability and minimize service interruptions.

EHA superior for pitch control

Parker has developed a robust, self-contained electrohydraulic actuator (EHA) system that provides utility scale PV developers with an ideal solution for adding PV pitch control into large solar field installations. The compact EHA system is a completely self-contained unit combining a double-acting actuator, pump, and electric motor that eliminates nearly all leak paths into or out of the package. It offers clear advantages over comparable electromechanical actuator (EMA) systems because all the internal wear items are permanently lubricated for extended life and the power density of an EHA is typically three times that of a comparable EMA. Designing an EHA into a pitch system allows designers to move more PV panels with fewer actuators and controls, resulting in lower installation costs and longer service over the life of the solar field.
Power Source: SOLAR

Robust solutions that result in maximum power generation utilization

Look to Parker for:

Concentrated Solar Power (CSP) Solutions

- Hydraulic rotary tracker for CSP
- Electrohydraulic linear positioner for PV pitch control
- Utility scale central inverter for PV

Photovoltaic (PV) Solutions

- Thermal management for PV electronics
- Electrohydraulic linear positioner for PV pitch control
- Utility scale central inverter for PV

CSP SOLUTIONS

- Engineered HPV and hydraulic cylinders for CSP tracking systems
- Portable hydraulic oil purification system
- Robust solutions that result in maximum power generation utilization
- Power Source: SOLAR

PV SOLUTIONS

- Engineered HPV and hydraulic cylinders for CSP tracking systems
- Portable hydraulic oil purification system
- Robust solutions that result in maximum power generation utilization
- Power Source: SOLAR

Thermal management for PV electronics

- Electrohydraulic linear positioner for PV pitch control
- Utility scale central inverter for PV

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- Utility scale central inverter for PV

Portable hydraulic oil purification system

- Engineered HPV and hydraulic cylinders for CSP tracking systems
- Portable hydraulic oil purification system
- Robust solutions that result in maximum power generation utilization
- Power Source: SOLAR

Thermal management for PV electronics

- Electrohydraulic linear positioner for PV pitch control
- Utility scale central inverter for PV
Water energy is the power generated by flowing or falling water. Capturing it has traditionally taken the form of hydro dams, pumped storage reservoir installations, or river water wheels which have proven to be efficient and cost-effective ways to produce electricity. Today, work is also being done to harness the mechanical power held in the movement of the ocean with innovative and often unusual wave and tidal turbines.

Whatever the generation method, Parker is there with a wide range of motion and control systems and components. From cylinders that move the wicket gates in hydro dam installations and the array cables that export the electricity from ocean wave turbines to the transformer stations ... to the gearbox lubrication systems on tidal turbine generators and advanced, cooled electrical power conversion systems ... Parker has the experience, products, and technical competence needed to further the science of water energy. As well as the global presence necessary to supply and support its capture.

Subsea electrical array cables

When you’re generating electricity in the middle of the ocean, transporting the power can be a problem, but Parker Scanrope in Norway has a solution. The division manufactures mooring lines that both attach an ocean wave power generation device to the seabed and export its electricity to offshore transformer stations through subsea electrical array cables.

Parker Scanrope has years of experience producing and servicing products for the offshore industry. With its own quay to enable direct loading of the mooring lines and cables to the cable-laying vessels, Parker Scanrope combines expertise with flexibility to best serve its customers.
Hydro expertise
Hydraulic cylinders are the highest form of renewable Energy. From “nano-hydro” to “mega-dam”, Parker engineers design systems ranging from sophisticated hydraulic systems to state-of-the-art controls. Parker systems optimize turbine upgrade and enable OEMs with critical technologies ranging from hydraulic, pneumatics, and electronic-control systems to sealing solutions used inside the turbines. By working with Parker, you’ll benefit from collaborative engineering at the beginning of the project and field support through the entire construction cycle.

Look to Parker for:

- Power Source: WATER
- Power Source: HYDRO
- Wave/Tidal Solutions
- Solution:  Wave attenuation energy converters
- Solution:  Point absorber
- Solution:  Paddle style wave harvesters
- Solution:  Mooring lines and subsea electric cables
- Solution:  Total turbines

Hydro Solutions

- Designed for hydraulic systems
- Provide high power density and practical solutions
- Paddle: high performance cylinders and high performance electric development
- Parker: E3 Family of over-rotated design solutions
- Parker: International standard for high-level applications
- Parker: Optimized E3 tilting provide leak-free connections for standard tubes
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

Wave/Tidal Solutions

- “Wave attenuation” energy converters
- “Point absorber” energy converters
- “Paddle style” wave harvesters
- Mooring lines and submarine electric cables
- Total turbines

Hydro Controls for turbines and generators

- Provide the highest control points
- Parker: E3 Family of over-rotated design solutions
- Parker: International standard for high-level applications
- Parker: Optimized E3 tilting provide leak-free connections for standard tubes
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

Bearing tube oil system

- Design: hydraulic turbines and generators
- Parker: E3 Family of over-rotated design solutions
- Parker: International standard for high-level applications
- Parker: Optimized E3 tilting provide leak-free connections for standard tubes
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

Safe actuation

- High performance, high reliability, and durability
- Parker: manufacturing highly engineered, reliable cylinders to specific goals
- We can provide easy-to-order, high-quality products
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

Paddle style wave harvesters

- Paddle style wave harvesters
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

“Wave attenuation” energy converters

- “Wave attenuation” energy converters: Tailored for large wave swells and harsh weather conditions
- Parker: E3 Family of over-rotated design solutions
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“Point absorber” energy converters

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Mooring lines and submarine electric cables

- Mooring lines and submarine electric cables
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

Total Turbines

- Total Turbines
- Parker: high-performance, high-reliability consumers
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

Grid tie power conversion systems

- Parker: high-performance, high-reliability consumers
- Parker: robust design for medium- and high-level applications
- Parker: robust stainless steel connections

Hydraulic systems

- Parker: high-performance, high-reliability consumers
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DF Plus proportional valves

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Fluid Connectors

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Accumulators

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DP Plus proportional valves

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Other hydraulic system stability solutions are continually added.
- Parker: hydraulic system stability solutions for additional information on Parker hydraulic systems.
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Expertise that can turn biogas into energy

Originating from biomass, biogas is gaining increasing worldwide importance as a recognized renewable energy source. Biogas production is contributing – and will continue to contribute – to future energy supplies, replacing more and more fossil fuel sources such as coal, oil, and natural gas. Spearheaded by Germany, extensive work undertaken throughout many countries in Europe will lead to the perfection of biogas production. Parker’s extensive expertise in the areas of filtration, moisture removal, cooling and drying of bio, sewage, and landfill gases will play an important role in mainstreaming this critical energy resource.

Siloxane removal system improves the profitability of biogas-to-energy projects

Biogas generated in landfills and waste digesters contains siloxane – a man-made chemical that changes into silicon dioxide when combusted. When landfill and digester gases are used to fuel turbines, reciprocating engines, and fuel cells that generate electricity, silicon dioxide buildup due to siloxane significantly increases maintenance costs, reducing the feasibility of these important green energy projects. Parker’s siloxane removal system eliminates siloxanes from biogas, reducing maintenance costs and improving profitability for greater cost-effectiveness.

Hyperchillers cool and dehumidify aggressive bio, landfill, and sewage gases

Parker Hyperchiller bioenergy chillers offer high efficiency performance in aggressive landfill and sewage environments, with special protective treatment on the condensers and copper piping for reliable operation. They are particularly effective when paired with Parker tube bundle heat exchangers and Parker water separators.

These compact chillers have proven to be durable, with excellent reliability and flawless performance under many different operating conditions. Their closed water temperature operation provides high working limits and low running costs. Many options make them highly adjustable for specific operating conditions.
Power Source: BIOGAS

Filling the pipeline with gas

1. **Pre- and post-filters**
   - Our low pressure range biogas filter increases process safety by protecting the biogas engine. This filter removes contaminants from the gas stream, protecting the downstream gas engine.

2. **Gas-line removal system**
   - Parker's highly efficient and proven filters are available with various element grades, purifying gas, providing maximum process safety and ensuring the extended life of the downstream gas engine.

3. **Pressure swing adsorption dryer**
   - Parker's regenerative twin tower adsorption dryers ensure reliable gas dehumidification, achieving pressure dew points of -94º to -130ºF (-70º to -90°C). Our high performance chillers provide additional energy savings, increasing profitability for greater cost-effectiveness.

4. **Water separator/de-mister**
   - Parker filters offer superior sealing and performance in demanding corrosive environments. A-LOK’s rear ferrule resists inter-granular corrosion, creating tube fittings that offer superior resistance to environmental corrosion.

5. **Energy storage systems**
   - Parker’s skid-mounted biogas chilling systems are designed for use in gas motors or turbines. How-ever, on-site installation of individual equipment is both time-consuming and expensive.

6. **Energy storage systems**
   - Parker’s regenerative twin tower adsorption dryers ensure reliable gas dehumidification, achieving pressure dew points of -94º to -130ºF (-70º to -90°C). Parker’s adsorption dryers ensure economic gas processing and high capacity float drain is used in landfill, sewage, and biogas installations.

7. **Condensate drain**
   - Parker’s highly efficient and proven filters are available with various element grades, purifying gas, providing maximum process safety and ensuring the extended life of the downstream gas engine.

8. **Water separator/de-mister**
   - Parker filters offer superior sealing and performance in demanding corrosive environments. A-LOK’s rear ferrule resists inter-granular corrosion, creating tube fittings that offer superior resistance to environmental corrosion.

9. **AC drives**
   - Parker’s highly efficient and proven filters are available with various element grades, purifying gas, providing maximum process safety and ensuring the extended life of the downstream gas engine.

10. **Tube bundle heat exchanger**
    - Parker’s highly efficient and proven filters are available with various element grades, purifying gas, providing maximum process safety and ensuring the extended life of the downstream gas engine.

11. **PTFE hose**
    - Parker’s highly efficient and proven filters are available with various element grades, purifying gas, providing maximum process safety and ensuring the extended life of the downstream gas engine.

12. **Parflange® F37 connections**
    - Parker’s highly efficient and proven filters are available with various element grades, purifying gas, providing maximum process safety and ensuring the extended life of the downstream gas engine.
Utility scale battery energy storage systems; Advanced thermal management technology

Parker offers a full range of solutions for utility scale battery energy storage, from bidirectional grid tie inverters to outdoor duty power conversion systems to climate-controlled battery containers. The product of more than 35 years of power conversion experience, our grid tie inverter systems reliably charge battery banks during periods of low demand, and efficiently discharge them to the supply grid at a constant frequency as needed, while delivering exceptional power quality. Energy storage systems are often integrated with renewable energy sources such as solar and wind farms, but when combined with traditional generating sources, can provide benefits of lower emissions, better grid stability, and lower fuel consumption.

Applications:
- Frequency regulation
- Integration of renewables
- Micro-grid solutions
- Power factor control/volt-ampere reactive (VAR) support
- Ramp rate control
- Transmission and distribution (T&D) upgrade deferral
- Spinning reserve
- Black start

Look to Parker for:
1. Bidirectional grid tie inverters
2. Integrated energy storage/battery containers
3. Outdoor duty power conversion systems
4. Thermal management for battery containers and power electronics

Look to Parker for:
1. Bidirectional grid tie inverters
   At the heart of an energy storage power conversion system is the grid tie inverter.
   Parker manufactures a modular solution with proven efficiency and uptime. Designed to be easily maintained and serviced, the inverter racks deliver high power density and a small footprint, and feature highly efficient two-phase evaporative liquid cooling technology.

2. Advanced thermal management for power electronics
   Parker offers advanced two-phase "evaporative" liquid cooling technology to efficiently cool power electronics, using a modular cold-plate design for use with any inverter. The technology’s inherent efficiency can enable up to twice the density and can provide up to a 60% increase in power throughput from existing electronics, in a safer, more reliable solution.

3. Outdoor duty power conversion systems
   Parker provides outdoor-rated power conversion systems in sizes and ratings to suit applications from micro-grid to full utility scale. All enclosures are easily transported, deployed, and commissioned, and can be specified for the most extreme environmental conditions.

4. Integrated energy storage/battery containers
   Configured to customer requirements for a variety of different battery systems, Parker delivers turnkey containers that include adaptive climate control, fire suppression systems, lighting, container hardening, battery racks, safety agency approvals, and tie-ins to power conversion systems.

>> Energy storage system

Situation:
Renewable sources of power may be cyclic or unpredictable, making them difficult to integrate with the power grid. Power may be generated when demand is low, but not during times of peak demand when it is most needed.

Solution:
Utilize energy storage system to provide capacity, using energy stored in batteries to support the grid during peaks and absorbing energy when the grid is at capacity. The capability to store energy can also eliminate curtailment or dumping of renewable energy when it is plentiful, but not demanded.

Customer Advantage:
- Maximizes the net output of a wind or solar power installation, increasing revenue for the owner/operator.
- Provides a more reliable solution.

Situation:
Conventional power plants are required to maintain overload capabilities for periods of peak demand. Overload capabilities often include spinning reserve, fossil fueled generating resources that are kept idling even when not called for.

Solution:
Energy storage systems can provide for the reserve capacity, without burning fuel or producing emissions. With sub-cycle response time and high round trip efficiency, the energy storage system can take the place of traditional reserves.

Customer Advantage:
- Satisfies requirements for overload capacity, without burning fuel or producing emissions.

Situation:
A projected increase over time in power usage will eventually make existing power transmission and distribution lines the "weak link" between power plant and consumer. In time, if the power demand continues to increase, it will require a costly upgrade in transmission hardware.

Solution:
Utility scale energy storage can be quickly deployed near the load to reduce peak demands on the existing power lines. This resource addition can defer a major expense for a period of time. Parker’s containerized solution can be easily relocated once the upgrade is completed.

Customer Advantage:
- Expands the timeframe to upgrade transmission line capacity is deferred.

Advanced, refrigerant-based cooling
Our advanced thermal management technologies are key to our ability to offer efficient, cost-effective energy storage and power conversion. Specifically, with two-phase evaporative precision cooling, Parker has been able to cool the full range of wind and solar power generation systems, delivering up to a 40% increase in throughput and more than twice the power density, significantly reducing the overall space requirements for power conversion and grid tie systems. This closed loop, advanced cooling system uses a non-conductive, non-corrosive refrigerant that vaporizes on contact with hot electronics and cools more efficiently than any other air or water based system.

Innovation in Action