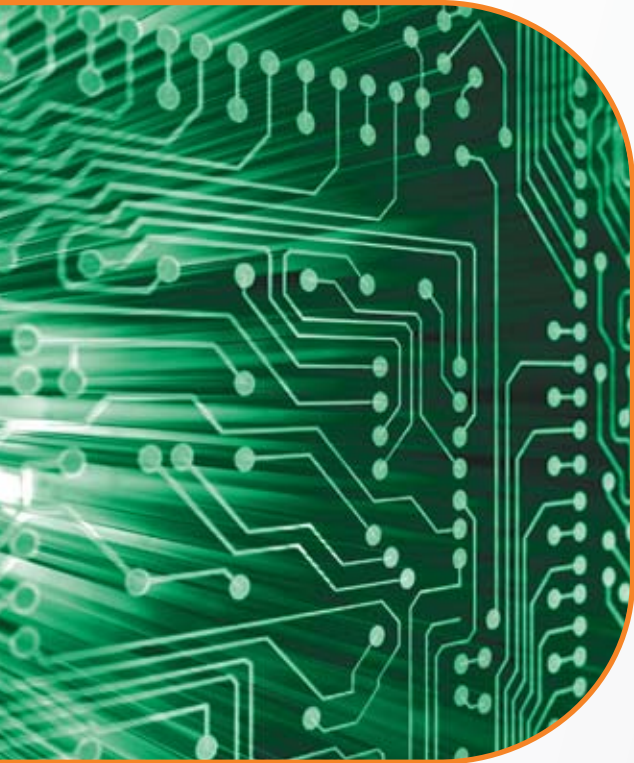


alternative  
energy



CAPABILITIES



# Complete Solutions for Your Clean-Tech Designs.

Arrow Alternative Energy is dedicated to providing solutions-oriented support for engineers designing for energy generation, energy distribution, and overall efficiency.



## Arrow Electronics Alternative Energy

Whether your next project encompasses solar, wind, harvesting, electric vehicle (EV) transportation, or storage; energy distribution in the form of smart grids, smart meters, automated meter infrastructure, EV charging stations, or home area networks (HANs); or you're striving to make your products greener, Arrow offers a vast selection of products, services, and complete solutions to fully support your clean-tech designs from concept development to production. And, if your company is emerging, large, or some place in-between, we can meet your needs with as much or as little assistance as you require.

## Vast Line Card and Unrivaled Support

Arrow's deep and broad line card features components and complete solutions from suppliers with proven experience in meeting the demands of this market. The fact that we have influential relationships with our suppliers' energy business contacts—and that we continuously evaluate emerging suppliers—enables us to connect you with the industry's most innovative technologies. Our renowned services, including comprehensive design, engineering support, systems integration capabilities, and supply chain management are backed by Arrow's distinguished technical know-how—helping you to meet or exceed all your clean-tech needs and accelerate your journey to market.

To learn more, visit [www.arrow.com/AlternativeEnergy](http://www.arrow.com/AlternativeEnergy), call your Arrow representative at 800-833-3557, or email [energysolutions@arrow.com](mailto:energysolutions@arrow.com).



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# GREEN TECHNOLOGY



## MAKING THE WORLD GREENER THROUGH ALTERNATIVE ENERGY

Over the next two decades, the amount of energy needed around the world will double, while world leaders strive to reduce carbon emissions by half. To achieve this, new technologies will be required, and significant adjustments will have to be made to consumer behavior.

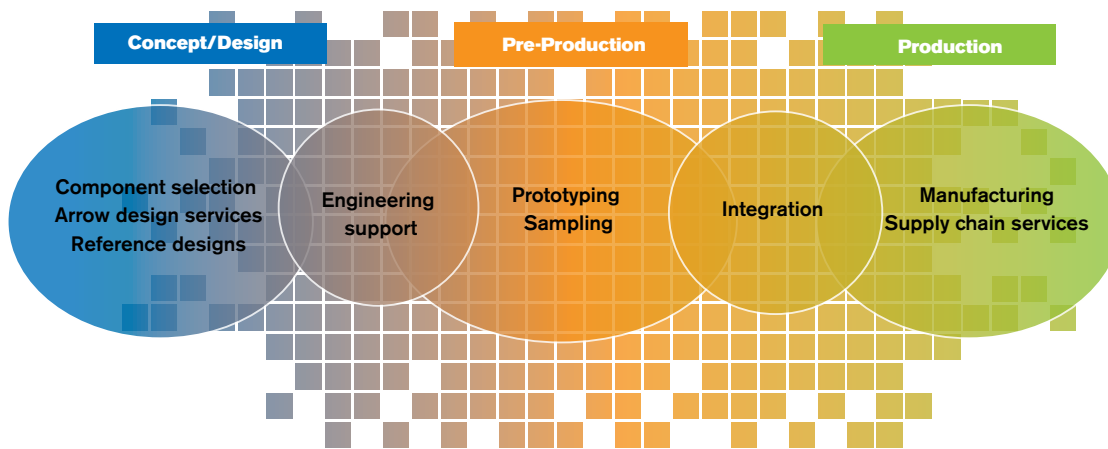
Arrow's wide selection of components, integrated devices, and design kits form complete solutions that maximize the efficiency of your designs while minimizing impact on the environment. Arrow Alternative Energy specializes in pulling the right parts from the right suppliers together for the optimal result, and can solve even the most challenging clean-tech scenario.

**Arrow provides numerous industry-proven solutions for your green designs, including:**

- *Energy harvesting solutions*
- *Power supplies*
- *RF and wireless solutions*
- *Discrete and module-level solutions for smart grid, smart meter, and HAN applications*
- *Specialty connectors*
- *Power semiconductors and passive components*
- *LED lighting solutions*



# CONCEPT-TO-PRODUCTION SUPPORT



## OUR ENGINEERING SERVICES SET US—AND YOU—APART

A comprehensive, solution-focused approach and unrivaled expertise set Arrow's engineering services apart. Some of the ways we'll help move your designs from concept to production faster:

### Arrow Field Applications Engineers (FAEs)

- Support our field sales team
- Are trained by our suppliers
- Typically have a minimum of ten years' design experience

### Engineering Solutions Center

- Your FAE can access expertise for any application
- FAEs are supported by Arrow's team of specialists in alternative energy and several other end markets, and by our supplier network

### Arrow Consulting Engineering Services (ACES)

- Access pre-screened, qualified, and certified third-party energy focused service companies
- Our ACES partners have experience designing for clean tech and smart grid/smart meter applications, including:
  - Analog, power design, and wired and wireless communication
  - Module-level design that's ready to be modified to your exact project requirements

### Testdrive<sup>SM</sup> Tool Evaluation Program

- Try tools before you buy them!
- Free of charge for 21 days

### Custom Logic Solutions (CLS)

- Experienced ASIC development team
- Supports digital, analog, and RF designs with world-class technology partners and extensive IP portfolio
- Complete design and supply chain solutions for your metering and solar requirements

### Dedicated Team of Passive, Electromechanical, and Connector (PEMCO) Experts

- Deployed throughout North America
- Regional PEMCO sales engineers help you design in the best solutions
- Design assistance with off-the-shelf and value-added power solutions reduce design time and costs

### arrowdevtools.com<sup>TM</sup>

- Intuitive online development tool selection and purchasing process
- Fast access to a broad range of development tools

Involve our technical team early on! Our team is knowledgeable about products and solutions from numerous leading suppliers. Use our insight and established relationships to help architect your next system.

# WORLD-CLASS SERVICES



## SUPPLY CHAIN AND MANUFACTURING SUPPORT SERVICES

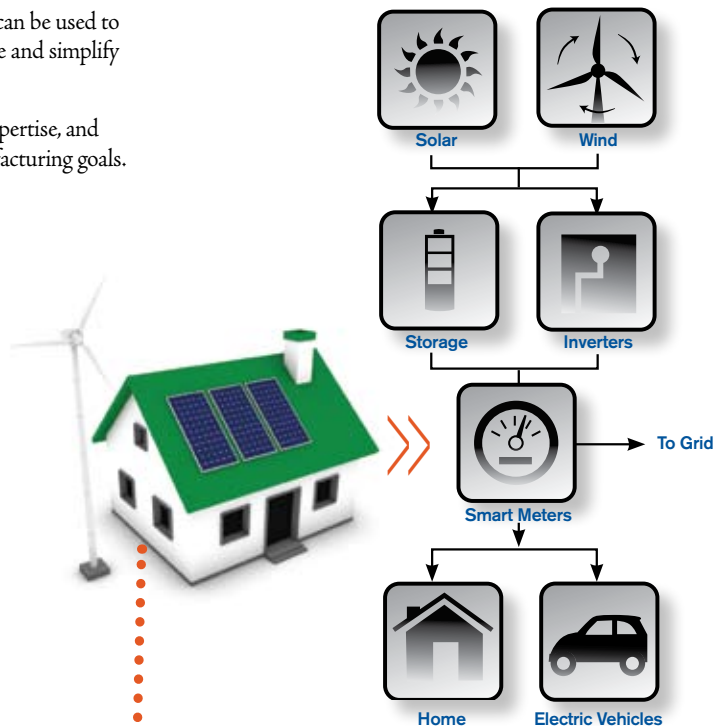
Arrow offers a broad range of supply chain and value-added services that are designed to add greater levels of flexibility, reliability, and efficiency to your supply chain.

Customized to help you achieve your specific business goals, these services can be used to improve your ability to react to changing customer requirements, streamline and simplify your supply chain, reduce total costs, and improve cash-to-cash cycle time.

With years of experience and thousands of satisfied customers, our staff, expertise, and quality-certified facilities are ready to support your supply chain and manufacturing goals.

### Just a few of the services offered by Arrow:

- *Supply chain analytical services*
- *Forecast management*
- *Vendor-managed inventory*
- *Global supply chain design and manufacturing support*
- *Kitting, turnkey, and system integration services*
- *Component replenishment services*
- *Custom/modified power supplies*
- *Custom part marking*
- *Device programming*
- *Electronic data services*



### The deployment of smart meters .....

requires other improvements that result in a smarter, more load-balanced grid, as well as the development of HANs. These improvements provide consumers with a more comprehensive and affordable means to harness clean energy, such as solar and wind, in order to power electric vehicles and other appliances, while also giving them the option to sell excess energy back to utility providers.

## SOLAR SOLUTIONS

Arrow is aligned with the world's leading solar technology focused suppliers to support the growth and evolution of this market with a vast selection of components, devices, and complete solutions. We can help you identify the best method for energy conversion, energy storage, and tying to the grid, and our engineers can help you design the most efficient system possible—meeting your needs and getting you to market quickly.

## ARROW SUPPORTS NEXT-GENERATION INVERTER AND MICROINVERTER TECHNOLOGY

Arrow can connect you with solutions developed in tandem with our supplier partners, targeting both microinverter and string inverter technology. A solar inverter is critical to a solar energy system, and at the heart of the inverter is a real-time microcontroller. Since solar energy systems must work to transform a highly variable DC power source into a steady AC source that will not impair sensitive electronic equipment, your designs must efficiently and effectively improve the DC-to-AC energy cycle.

Arrow Alternative Energy and its supplier partners provide real-time microcontroller solutions that execute the precise algorithms required to charge a solar energy system's battery and supply power to the electrical grid without power losses. We understand your environmental constraints, and have partnered only with suppliers that have demonstrated success in this market.

## ELECTRIC VEHICLES

EV transportation will be a key element within the overall alternative energy landscape. Electric cars, bicycles, and motorcycles will play a large role in the reduction of CO<sub>2</sub> gases. As governments increase regulations for vehicle emissions and provide consumers with tax incentives for electric vehicles, the demand for EV transportation and charging stations will greatly increase.

**Arrow is aligned with the world's leading EV technology providers, and supports this emerging industry through:**

- *Battery management*
- *Power conversion*
- *Motor control*



**In addition to providing access to the most current technologies, Arrow can help you:**

- *Manage key design considerations for the solar market, including power conditioning*
- *Maintain a stable output of electricity versus time and temperature*
- *Prevent batteries from overcharging*
- *Optimize solar energy through various maximum power point tracking (MPPT) methods*
- *Maximize the efficiency of power generation*



# CLEAN TECHNOLOGY



## WIND SOLUTIONS

Diminishing resources and the increasing need to protect our environment have created huge market opportunities for wind as an alternative power generator. Wind turbine energy is already helping to meet the world's quickly growing energy demand, and its usage will continue to increase. The conversion of wind energy into utility-grade AC power, or on a smaller scale, to provide household AC, requires a wide array of electronics and specialized expertise—and Arrow is positioned to meet your wind system needs with the industry's foremost line card. Our line card features products from world-class suppliers with proven success in wind energy technologies, backed by our outstanding services, solutions, and technical expertise.

## ARROW SERVES THE SMALL WIND SYSTEM MARKET

A small wind system typically includes a tower, turbine, generator, an AC/DC rectifier, control electronics for the entire system, a rechargeable battery module (often for off-grid wind energy systems in remote locations or in difficult terrain), an inverter, and interconnect products to bring the entire system together. Arrow provides access to suppliers specializing in wind system solutions, and has the expertise to implement variable speed control technology to maximize the energy captured and minimize turbine drive-train loads. We offer inverter solutions created in conjunction with our supplier partners to connect your system to the grid and supply code-compliant power.

**Arrow Alternative Energy can help you address and manage key design considerations for wind applications, including:**

- *Mitigating harsh environments, lightning, and vibration*
- *Monitoring and controlling circuitry to accommodate varying wind conditions*
- *Optimizing efficiency*



# SMART GRID/SMART METER SOLUTIONS

The smart grid sector is currently the fastest growing segment of the utility industry, and space for innovation is wide open. Arrow can support your smart grid, smart meter, and HAN designs with technologies and complete solutions from suppliers with proven success in this market, supported by our unrivaled services and expertise. Arrow Alternative Energy can help you design smarter grid and meter applications that will innovate the way utilities relate with customers, resulting in greater energy efficiency.



## ARROW IS AT THE FOREFRONT OF SMARTER GRIDS AND METERING

Arrow can connect you with control technologies needed to reduce blackouts and improve grid reliability, as well as provide distributed generation solutions—which will be used more and more frequently in community-scale installations—developed in conjunction with our supplier partners. The next two decades will present some of the most drastic changes the industry has ever experienced, and Arrow will be here to help you adapt your designs.

As outdated power grids are refurbished, smart utility metering for gas, water, and electricity is gaining momentum because it encourages adoption of clean energy generation while improving the load balancing capabilities of the smart grid. In addition, with consumers' greater interest in EVs, utilities must manage how this increase in demand will impact the power grid. Increased peak loads and overloaded transformers could damage EVs or disrupt grid service. Utilities must use smart grid technology to understand where and when consumers have EVs plugged in and distribute the charging load to prevent damage or loss of the system. EV charging stations will also utilize smart grid technology for automated customer billing and flexible rate options.

With government stimulus money being funneled toward alternative energy projects, demand for smart grid and metering applications is escalating. Arrow's vast line card featuring world-class suppliers can tie your entire solution together, including meters, home thermostats, and appliances, as well as the technology that will enable your HAN to communicate wirelessly. Arrow can provide unsurpassed support and expertise at each point of your journey to market.

Smart grid and smart meter applications hold the key to improving energy efficiency on a large and dramatic scale, and Arrow Alternative Energy is ready to assist original equipment manufacturers in managing crucial design considerations amid the overhaul of our grids, including advanced metering infrastructure (AMI).

**Arrow is poised to support all the other major smart grid applications and market segments, including:**

- *Smart networks/homes*
- *Demand response*
- *Grid optimization*
- *EV charging stations*
- *Energy storage*
- *Distributed generation*
- *Advanced utility control systems*



# ENERGY HARVESTING

## HARVESTING SOLUTIONS

Your designs can take advantage of the environment's readily available energy with the help of Arrow. Energy harvesting, also known as power harvesting or energy scavenging, is the use of ambient energy to power small electronic or electrical devices. It's also an ideal substitute for impractical or expensive batteries, or those that are difficult or hazardous to replace. Arrow connects you with innovative energy harvesting technologies and solutions we've developed with our world-class supplier partners, and backs these solutions with our renowned services and expertise to help you get to market fast.

## ARROW IS ON THE LEADING, GREEN EDGE OF HARVESTING

Micro energy harvesting ( $\mu$ EH) pertains to energy harvesting specifically for small, autonomous devices. Ambient energy is found in the form of thermal, solar, wind, and mechanical or kinetic energy. It is often available only in minute quantities at any given time, and after it is captured, it needs to be accumulated, conditioned, stored, and managed. Until recently, it has not been possible to capture energy to the degree needed to perform useful work. A typical energy harvesting system includes an ultra low-power microcontroller, energy storage and power management elements, sensors, and a low-power transceiver, all of which Arrow can help you procure and put together optimally.

In addition, Arrow is positioned to:

- *Connect you to the latest innovations, such as solid-state, rechargeable, and thin film micro energy storage devices*
- *Help you manage key design considerations for energy harvesting, including compact size, wireless sensor networks, and ultra-low power requirements*
- *Enable you to take advantage of the growing market for self-powered devices powered by  $\mu$ EH*



### Some of the innovative energy harvesting applications include...

wireless sensor networks, asset tracking, active RFID, portable medical equipment, infusion pumps, glucose monitors, unmanned military vehicles, and communications equipment.



THE POWER OF ARROW ELECTRONICS **ONLINE**



## MyArrow™ is your online connection to your Arrow account and sales team.

### Benefit from:

- Custom pricing and payment terms
- Access to over 4.5 million components
- Our best-in-class search engine
- 24x7 access to your Arrow sales team
- Quotes directly from your Arrow representative
- Our forecast response tool
- Automatic part change notifications
- Our bill of materials upload tool
- More enhancements coming soon!

Visit [www.arrow.com/myarrow](http://www.arrow.com/myarrow) to set up your free account today! Or, contact our Online Support Team at 877-237-8621 to learn more.

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## THINERGY®

THINERGY® Micro-Energy Cell (MEC) products are innovative, paper-thin, solid-state batteries that provide ultra-efficient energy storage with unrivaled power density, discharge capacity, cycle life, and service life. Unlike other conventional rechargeable batteries, THINERGY MECs can be recharged countless times, and can be deeply embedded for the lifetime of the system. THINERGY MECs, with decades of service life, can be used for real-time clock and solid-state memory backup power, replacing coin cells and supercapacitors in many applications. When combined with ambient energy harvesting, these MECs also provide low cost perpetual power for remote wireless sensors, smart meters, and other microelectronic devices that need autonomy.

These Curiously Powerful™ MECs are truly unique and offer the ideal maintenance-free power solution.



Infinite Power Solutions®

[www.InfinitePowerSolutions.com](http://www.InfinitePowerSolutions.com)

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THE WORLD LEADER IN SOLID-STATE,  
RECHARGEABLE, THIN-FILM MICRO-ENERGY  
STORAGE PRODUCTS



## DC link power film capacitors

Next generation inverter designs for renewable energy applications demand reliable DC link capacitors with higher capacitance values, voltage, and current ratings. Now available in new case sizes, Cornell Dubilier's expanded range of Type 947C power film capacitors meet or exceed the requirements for bulk energy storage, ripple filtering and life expectancy for wind and solar power inverter designs, as well as electric vehicle applications. Select from hundreds of standard catalog listings, or connect with CDE engineers to develop special designs to your requirements.

**For sample requests or more technical information, visit [www.cde.com/arrow](http://www.cde.com/arrow)**

### TYPE 947C POWER FILM CAPACITORS

85, 90 & 116 mm CASE SIZES

CAPACITANCE VALUES TO 1500  $\mu\text{F}$

APPLIED VOLTAGE TO 1300 Vdc

RIPPLE CURRENT RATINGS TO 100 A<sub>rms</sub>

CAPACITOR SOLUTIONS FOR POWER ELECTRONICS



# Energy Harvesting Now



## Free Power from Thermal, Kinetic & Solar Energy

Our new analog IC solutions enable the commercial deployment of energy harvesting from a variety of “free” energy sources. An appropriate transducer placed on the energy source delivers an electrical signal that our products convert and condition into usable power. These revolutionary ICs consume only nanoamps of current to provide high efficiency power conversion with minimal external components.

### ▼ Energy Harvesting IC Family

Part Number	Description	Energy Source
LTC®3105	400mA boost converter with MPP control and 250mV start-up	☀️ 🔥
LTC3108	Ultralow voltage boost converter and system manager	☀️ 🔥
LTC3109	Auto-polarity version of LTC3108	☀️ 🔥
LTC3588	Piezoelectric energy harvesting power supply	🔊 🔋
LT®3652/HV	Power tracking 2A solar battery charger	☀️
LTC4070	Nanoamp operating current shunt Li-Ion battery charger	☀️ 🔥 🔊 🔋

### ▼ Info & Free Samples

[www.linear.com/energyharvesting](http://www.linear.com/energyharvesting)

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