

Reducing Dependence on Fossil Fuels Megatrend

Delivering on the promise of a low-carbon economy



DuPont Photovoltaic Solutions

Delivering a broad and growing portfolio of solutions to crystalline silicon and thin film solar cell and modules.

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DuPont Biofuels

Leveraging science to commercialize sustainable advanced biofuels.

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DuPont Wind Energy

Protecting wind turbines by encapsulating components of the generator that protect against extreme heat.

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The Challenge

Energy is a global concern. Whether the focus is on energy security, climate change, population growth or the new reality of the global economy where demand for natural resources is increasing while availability is decreasing, the world needs to use energy smarter and generate it from more renewable sources. The World Energy Outlook predicts that in the next 25 years, energy consumption will increase by 60 percent with the majority of this growth occurring in developing countries. The share of renewable energy, though growing, will remain largely unchanged at approximately 14 percent. The generation and storage of renewable energy will be the fastest growing sector in the energy market for the next 20 years. Also important will be reducing the use of fossil fuels through energy efficiency in industries such as construction and transportation and the use of renewably-sourced products that replace petroleum as a feedstock.

The DuPont Value Proposition

DuPont is in a unique position with a proven history in energy conservation, many products that help improve energy efficiency in the construction and auto industries, and a growing suite of solutions across alternative energy applications. Today's challenge is finding secure, environmentally sustainable and affordable energy sources. We are applying the power of our science to help address this challenge.

The Market Opportunity

Alternative Energy: Photovoltaic solar energy is expected to grow from a \$30 billion industry today to \$55 billion by 2012. Annual installations were just shy of 3 gigawatts worldwide, up nearly 500 percent from just four years ago. DuPont expects its sales of several products into this industry will exceed \$1 billion by 2012.

Biofuels are becoming an increasingly important part of the transportation fuels sector, growing at more than 10 percent a year and representing a global market space in excess of \$30 billion.

Wind power is projected to expand from \$30.1 billion in 2007 to \$83.4 billion in 2017. By 2020, experts predict that wind will generate about 12 percent of world electricity needs, but the reliability of generating equipment is essential to the success of the rapidly growing wind power industry. Fuel cells are expected to grow from a \$1.5 billion industry in 2007 to \$16 billion by 2017.

Renewably Sourced Products: The industrial biotechnology market is worth \$100 billion globally, according to the Industrial Biotechnology Innovation and Growth Team. Customer demand for DuPont products in this space has nearly doubled since the opening of the first renewably sourced production lines in 2006.

The DuPont Opportunity

Renewable Energy: DuPont offers numerous products and technologies to meet demand for renewable energy. DuPont is a leading technology supplier to the photovoltaic industry, offering a broad and growing portfolio of solutions that are designed to work together to help increase the efficiency and lifetime of solar modules. DuPont products are key to the manufacture of both crystalline silicon and thin film solar



DuPont Fuel Cells

Delivering expertise in polymer creation, electrochemistry, and large-scale manufacturing to enable the fuel cell industry to provide global scale clean energy solutions.

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Renewably Sourced

Helping reduce dependence on petroleum and the net production of greenhouse gases -- all without compromising performance.

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Energy Efficiency in Construction

Using sustainable solutions to make residential and commercial buildings safer, last longer and consume less energy.

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cells and modules. They include films, resins, encapsulation sheets, flexible substrates and conductive pastes, as well as high-performance seals for solar cell manufacturing equipment. The company is investing in capacity expansions to support the explosive industry growth and the development of new, innovative technologies to address different applications within the industry.

DuPont is developing a portfolio of biofuels that offer alternatives to meet global transportation energy needs. Cellulosic ethanol and biobutanol are two advanced biofuels technologies that will diversify the transportation energy sector and reduce reliance on petroleum. DuPont Danisco Cellulosic Ethanol LLC is accelerating the development of next generation biofuels with a goal of delivering cellulosic fuels to market by 2012. Working with DuPont's joint venture partner BP, Butamax Advanced Biofuels LLC is developing biobutanol that offers fuel properties similar to gasoline. Commercial availability of biobutanol is expected in 2013.

DuPont is providing key innovations to the wind and fuel cell industries as well. DuPont™ Nomex® is used in wind turbines to encapsulate the key components of the generator and protect them from the extreme heat inherent in the creation of electricity. DuPont™ Kapton® film is used in wind generators as electrical insulation for the generator wire alone or in combination with glass cloth or mica tape. DuPont™ Voltatex® resin insulates key components of wind generators from damaging heat, extending their life. In certain high-heat situations, Voltatex® is used in combination with DuPont™ Nomex® paper and pressboard for additional thermal protection. DuPont Fuel Cells enables the advancement of fuel cell technology and products by providing the science and innovation to make fuel cells a commercial reality in the near and long term. DuPont™ Nafion® membranes and dispersions provide durability, performance and lower cost. DuPont is also introducing new Nafion® based membrane electrode assemblies (MEA) platforms (Nafion® XL) to make fuel cells a commercial reality, within transportation, portable electronics (including consumer electronics) and stationary power target markets.

Renewably Sourced Products: DuPont is delivering high performance products made with renewable materials. Examples include DuPont Tate & Lyle Bio Products blockbuster Zemea™ and Susterra™ propanediol, 100 percent natural ingredients used in the personal care, liquid detergent and industrial liquids industries. DuPont™ Sorona® renewably sourced polymer is used in the carpet and apparel industries. And DuPont™ Cerenol™ is used in the personal care and functional fluid industries. In 2009, DuPont commercialized three families of high-performance, renewably sourced plastics for use in packaging, automotive, sporting goods and consumer durable applications.

Energy Efficient Products: Sustainable construction is a key market opportunity for DuPont. DuPont™ Roofliner with Elvaloy® and DuPont™ Tyvek® weatherization systems were created to seal buildings inside and out. According to DuPont data, together DuPont Tyvek® products for roofs and walls can offer up to 20 percent annual energy savings for a typical U.S. home. Additionally, DuPont is developing new refrigerant compounds as part of its ongoing program to seek longer-term, sustainable alternative solutions for refrigerants used widely in automotive air conditioning, home refrigerators, supermarkets and store display cases, and in building and home air conditioning systems. DuPont has identified and now is testing new refrigerants that are environmentally better and more energy efficient.

The stake for reducing vehicles' carbon footprint and improving fuel economy is high. Several studies show a 25 kilogram weight reduction can yield a 1 percent increase in fuel economy, depending on the vehicle. A 100-kilogram weight reduction can reduce carbon dioxide (CO2) emissions by 8.5 grams per kilometer. High-performance DuPont engineering resins make possible replacement of metal parts and components, contributing to weight reduction, fuel savings and CO2 emission reductions. The stake for reducing energy loss through friction is also high. Studies have shown that approximately 15 percent of the energy available in gasoline actually gets used to move a vehicle down the road. The remaining 85 percent of the energy is lost to engine and driveline inefficiencies, accessories and idling. DuPont™ Vespel® parts and shapes and DuPont™ Teflon® help the industry improve efficiency and get more power to the



wheel by reducing friction, especially in driveline systems. DuPont also is contributing to energy-efficient systems for the automotive manufacturing process. The DuPont EcoConcept system streamlines the OEM painting process by eliminating one complete coating layer, the primer-surfacer, and combining it into a single environmentally compliant water-based basecoat. This allows the automobile manufacturer to eliminate an entire spray booth and its associated drying equipment.

Energy Efficiency in Transportation

improving vehicle efficiency and performance through light-weighting materials, minimizing energy loss through friction and reducing energy used at vehicle manufacturing facilities.

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