



3M Technologies for Renewable Energy

According to the U.S. Energy Information Administration, world energy consumption is projected to increase by 71 percent between 2003 and 2030. Renewable energy is increasingly being seen by policymakers, investors and the general public as a viable way to help meet that demand – while addressing concerns about pollution, energy dependence and rising costs.

Following is a brief overview of some of the many ways 3M is helping renewable energy migrate from the wellspring of development to the mainstream of commercialization - with ingenious and practical ideas for improving performance, quality and reducing costs.

3M helped pioneer the practical application of solar power, with products such as 3M[™] Fresnel Lens Film, used for over 10 years in Concentrating Photovoltaic (CPV) arrays.

3M Fresnel Lens Film is helping to reduce the cost and improve the efficiency of largescale Concentrating Photovoltaic Arrays, such as this new installation in Madrid, Spain.



Complementing this technology are 3M[™] Mirror Films, being developed for use in larger scale Concentrated Solar Power (CSP) plants. In over twelve years of field testing for use as parabolic and heliostat

reflectors, 3M Mirror Films have demonstrated the potential to provide significant cost savings versus similar CSP plants utilizing glass based systems.





Solar

Over the past 20 years, improvements in technology and economies of scale have driven down the cost per kWh of solar-generated electricity to more competitive levels - positioning the solar power industry at the threshhold of a new era of unprecedented growth.

3M, one of the world's leading suppliers of advanced films and coatings, with broad technical expertise in optics, light management, weathering and more, is in an ideal position to help manufacturers engineer the next generation of efficient, reliable and costcompetitive solar panels, with advanced technologies for power components.



Prolonged exposure to harsh weather conditions, wide temperature swings and UV radiation can prematurely

degrade conventional film materials used in photovoltaic solar panels.

Dyneon™ Scotchshield™ Film is designed to provide durability and reliability required in solar panels. The unique, singlefilm construction of this Scotchshield film combines several Dyneon and 3M technologies to provide properties such as excellent UV stability, a low flammability rating, "self-cleaning" and resistance to weathering and yellowing.

Dyneon Scotchshield Film is from Dyneon LLC, a 3M company.

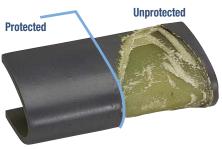
Wind Energy

Growing at an average rate of 25% a year, wind-generated electrical energy is fast becoming competitive with power from traditional generation sources. Designers, manufacturers and operators of today's multi-megawatt turbines require suppliers with the resources and technical expertise to help them enhance their competitive position. That's where 3M can help – with a wide range of proven products enhancing productivity, improving efficiency and reliability, and protecting worker health and safety.



In addition to offering a wide array of production proven products for manufacturing, assembly, maintenance, repair and worker safety, 3M's extensive technology portfolio can be your starting point for developing new ways to improve the performance and reliability of blades, towers, nacelles, and other components.

For example, 3M™ Wind Tapes, which leverage technologies used to protect the leading edges of wings, rotor blades, stabilizers, struts and other aircraft components, is now being applied on wind turbine blades to help extend service life and reduce maintenance costs.

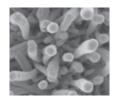


Biofuels

In 2005, world biofuel production surpassed 670,000 barrels per day. While this is still only about one percent of the total fuel used for transportation, production has doubled since 2001 and is poised for stronger growth.

One of the major roadblocks preventing the ethanol industry from achieving cost parity with conventional fuels is that processing and distillation of ethanol/water solutions obtained during fermentation consume large volumes of natural gas and water. To help solve this problem, 3M is developing an advanced membrane system that will continuously recover ethanol from the broth as it is formed. This results in improved ethanol recovery, lower production costs, and less energy required for distillation.





This is a high magnification photograph of a 3M Nano Structured Thin Film (NSTF) catalyst. These novel materials are produced by the

vapor phase deposition of catalytic materials such as platinum onto the surface of highly stable whiskers. This process is well suited for high volume production. In the resulting thin film format the catalyst materials have very high activity and thermal stability. Under development at 3M, NSTF catalysts have shown the potential to dramatically improve the cost and lifetime of MEAs.

Hydrogen Fuel Cells

3M is a primary developer and supplier of fully-assembled 3, 5 & 7-layer membrane electrode assemblies, or "MEAs," a key component of proton exchange membrane fuel cells. 3M MEAs can be found in a wide variety of commercial applications

around the world, ranging from automotive fuel cells and backup power modules to stationary power and battery replacement.



3M™ ACCR is being used in a growing number of commercial installations, over a wide range of climatic and operating environments. This proven, documented technology uses standard installation techniques, to help reduce total project costs.

Technologies for Energy Transmission

Power Transmission

Increasing urbanization and growing populations are putting a severe strain on power grids around the world. 3M™ Aluminum Conductor Composite Reinforced (ACCR) is designed to carry up to 3 times the electricity as the same size of conventional conductors – helping to relieve transmission bottlenecks without the need to build new towers. This not only saves time and money on installation, but also helps minimize environmental impact. 3M ACCR is light, durable and has low thermal expansion, for reduced sag at high operating temperatures and over long spans.

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Technologies for Energy Conservation

Rising energy costs, aging infrastructures and concerns about the environmental impact of conventional energy sources are raising awareness about the need to conserve power and reduce waste – both at home and on the job.

3M offers a variety of energy-saving products designed to save money, while helping reduce peak demands on power grids. These products range from sunblocking window films for building use to high efficiency air filters for commercial buildings. All are designed to help make more efficient use of our energy resources – without sacrificing comfort or convenience.



3M[™] Cool Roofing Granules are up to three times more

reflective than conventional colored granules, resulting in significant savings in energy required for cooling.





3M™ and Filtrete™ Filtration Media are widely used in commercial HVAC systems to remove dust, smoke, pollen and certain airborne pathogens from indoor air. Because of their ability to maintain high air flow through the system, they can also help significantly lower fan energy consumption, resulting in lower utility costs for building owners and less demand on the energy grid.



Because of their high degree of

reflectivity, 3M™ Mirror Films can be used to channel sunlight from roofs into rooms where additional lighting is desired. By using natural light from the sun, this helps reduce the need for artificial light sources, thereby saving energy. Light is diffused throughout the room with a 3M fresnel lens material.



consumers save on cooling costs without sacrificing passive lighting or views. And Prestige film contains no metal, so it won't corrode or interfere with cell phones or other wireless devices.



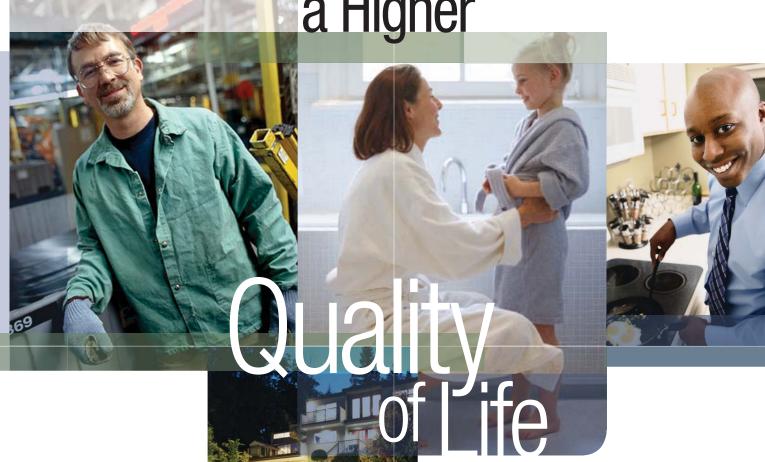
A dynamic technology base to meet emerging needs

3M is dedicated to making the "Uncommon Connection" between your toughest challenges and the wealth of potential solutions represented by 3M's rich technology portfolio. We do this by working closely with you to understand your needs; then using this knowledge to find practical and ingenious ways to help you achieve your business goals.

Adhesives	Am Advanced Materials	Biotech							Reclosable Fasteners
Abrasives	Drug Delivery	3M manufactures over 50,000 products derived from 40+ Core technologies, ranging from							Rp Radiation Processing
Acoustics	Display Materials	microre	,	nd nanoted		Nanotech	Nonwoven Materials	Polymer Melt Processing	Specialty Materials
Application Software	Dental & Orthodontic Materials	Films	Filtration, Separation, Purification	Immune Response Modifiers	Medical Data Management	Microbial Detection & Control	Precision Coating	Porous Materials & Membranes	Surface Modification
Ceramics	Electronic Packaging	Fluorinated Materials	Imaging	Integrated Systems Design	Metal Matrix Composites	Molding	Particle & Dispersion Processing	Process Design & Control	Wound Management
Chemical Power Sources	Flexible Converting & Packaging	Fiber Optics	Ip Inks & Pigments	Light Management			Precision Processing	Track & Trace	Vp Vacuum Processing



Powering a Higher





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