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# Nanotechnology Update

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Commissioned by

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## CONTINUING COVERAGE OF NANOTECHNOLOGY AND THE BUILT ENVIRONMENT

This report is ongoing coverage to a comprehensive industry review, *Nanotechnology and the Built Environment: The Transition to Green Infrastructure*, published November 2011 and available at [www.crystalra.com](http://www.crystalra.com) or from Livingston Securities, LLC by calling (212) 520-8481. This report contains a number of key developments since the release of the last update in **September 2012**.

### Key corporate developments on...

Abakan Inc. (ABKI-OTC) ▪ Cabot Corporation (CBT-NYSE) ▪ Cree, Inc. (CREE-NASDAQ) ▪ EnerNOC, Inc. (ENOC-NASDAQ) ▪ General Electric Company (GE-NYSE) ▪ Harris & Harris Group (TINY-NASDAQ) ▪ Itron, Inc. (ITRI-NASDAQ) ▪ Johnson Controls Inc. (JCI-NYSE) ▪ KiOR, Inc. (KIOR-NASDAQ) ▪ PPG Industries, Inc. (PPG-NYSE) ▪ The Sherwin-Williams Company (SHW-NYSE)

### Key industry news outlining new research and product/technology developments...

- *Popular Mechanics'* 2012 Breakthrough Awards Recognize the Latest Technology/Product Innovations
- New Halogen-free Nanomaterials in Development as Fire-resistant Construction Materials
- EU Commission Finds Existing Regulatory Framework to be Sufficient for Governing Nanomaterials
- Nanocellulose May Enable the Manufacturing of New Environmentally Friendly Materials
- Using Black Silicon to Capture the Full Solar Spectrum and Increase Solar Cells' Efficiencies
- Germany Illustrates Practical Success with a Reliable, Renewable Power Grid

**INNOVATIVE COMPANIES IN THE NANOTECHNOLOGY ARENA MAY BE THE KEY FOR NEW GROWTH AND VALUE IN ESTABLISHED BUILDING SECTORS, AS INVESTMENT IN NANOSCIENCE IS LEADING TO MORE ECOFRIENDLY, ENERGY-EFFICIENT, HIGHER-QUALITY INFRASTRUCTURE.**

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## Recent Corporate News

### **\*\*Abakan Inc. (ABKI-OTC)**

#### *MesoCoat Moves Toward Full-scale Commercial Clad Pipe Manufacture*

In October 2012, MesoCoat, Inc., a subsidiary of metal finishing company \*\*Abakan Inc., closed a low-interest \$1 million loan under the State of Ohio's Innovation Ohio Loan Fund, which allows MesoCoat to complete construction and equipment installation of its first full-scale clad pipe manufacturing facility in Ohio. This facility is expected to be completed in December 2012 and ready for commercial clad pipe production in March 2013. The company's cladding solution protects metal with nanocomposite metallic alloys that improve resistance to corrosion and wear. This technology is applicable to oil and gas, mining, marine, aerospace, and infrastructure markets, where it is expected to extend the life of metal components and reduce the maintenance and downtime costs of repairing corroded or worn-out parts.

#### *\*\*Abakan Files for NASDAQ Listing*

Additionally, in October 2012, \*\*Abakan also announced that it filed an application to list its Common Stock on the NASDAQ Capital Market. The NASDAQ listing application is subject to review and approval by NASDAQ's Listing Qualifications Department for compliance with all NASDAQ Capital Market Standards.

[http://abakaninc.com/pr\\_2012\\_10\\_04.html](http://abakaninc.com/pr_2012_10_04.html)

### **Cabot Corporation (CBT-NYSE)**

#### *New Cabot Transfinity XD7050 Product Delivers Superior Wear Performance in Mining Applications*

Cabot announced that it had launched Transfinity XD7050 to reinforce elastomer composites, the first of a new class of material specifically tailored for use in mining applications. This new product extends the wear life of rubber components used in mineral processing plants. Mine operators benefit from the high durability of this new material, which increases the service life of parts, significantly reduces maintenance downtime and cost, and increases output from existing assets. The material delivers superior resistance to abrasion, wet erosion, cutting, chipping, and tearing, allowing mineral processing equipment to run up to 100% longer between maintenance shutdowns. This patented technology employs liquid phase mixing versus conventional dry phase mixing in order to incorporate reinforcing agents such as carbon black into elastomers. The company exhibited at the MINExpo INTERNATIONAL® 2012, from September 24-26, 2012, in Las Vegas, Nevada.

<http://finance.yahoo.com/news/cabot-transfinity-xd7050-product-delivers-130000343.html>

### **Cree, Inc. (CREE-NASDAQ)**

#### *Cree LED Lighting Brightens Ronald McDonald House: Recent Expansion Provides Beautiful Light While Reducing Energy and Maintenance Costs by 65%*

The Durham, North Carolina, Ronald McDonald House location is opening a newly renovated facility with nearly 150 LED luminaires supplied by Cree, Inc. The expansion takes the house from 29 to 55 bedrooms and features a large kitchen, community room, school room, and library to serve children being treated at Duke Pediatric Hospital. Annually, the Ronald McDonald House in Durham hosts more than 1,000 families by providing a home away from home that lets families focus on their health and well-being. The newly installed Cree® LED lighting, including CR Series LED troffers and CR Series LED downlights, provides energy and maintenance savings estimated

at nearly 65% over the previously planned fluorescent lighting solution. The savings from installing LED lighting can provide the facility with opportunities to allocate valuable resources to other areas of the organization.

<http://finance.yahoo.com/news/cree-led-lighting-brightens-ronald-130000119.html>

#### **EnerNOC, Inc. (ENOC-NASDAQ)**

*Boston Properties, Inc. Wins EnerNOC's Energy Innovator Award*

EnerNOC recognized Boston Properties, Inc. with its annual Energy Innovator Award. The Award was presented at EnerNOC's annual EnergySMART Conference, which brings together leading operations and business leaders from around the world to discuss the latest advancements in energy management. The Energy Innovator Award is given to a single organization that has embraced data-driven energy management as a pillar of its long-term strategic planning and business operations. Boston Properties' energy efficiency efforts improve the operational costs of its buildings as well as create a highly sustainable workplace environment for its tenants. With uninterrupted monitoring of HVAC and other systems in each building, Boston Properties' energy managers build workspaces that maximize worker productivity and provide cost-effective, healthy environments.

<http://finance.yahoo.com/news/boston-properties-inc-wins-enernoc-182234435.html>

#### **General Electric Company (GE-NYSE)**

*GE and the U.S. Department of Energy Enter Agreement for the Long-term Storage of Carbon Dioxide*

As an alternative to releasing harmful quantities of CO<sub>2</sub> into the atmosphere, the Department of Energy and GE are exploring the possibility of storing CO<sub>2</sub> emissions underground in wells. To this end, GE has entered into a two-year, \$1.2 million joint venture with the Energy Department to provide proprietary fiber optic cable sensors to link together on long cables in order to track the CO<sub>2</sub> in the wells. Ultimately, the company is fabricating a fiber optic cable and sensing system, intended to measure things like pressure and temperature, in order to ensure confidence in the long-term stability of stored CO<sub>2</sub>. Work under this venture could begin as early as January 2013. As well, these sensors from GE could also be used for jet engine and turbine development.

<http://news.investors.com/business/100412-628146-ge-energy-department-to-develop-co2-storage-sensors.htm>

*GE Enters Into Agreement with Public Storage for LED Lighting*

On October 4, 2012, Public Storage and GE Lighting announced that it expected to save up to \$1.9 million annually in energy and maintenance costs by implementing GE's LED lighting solutions. Specifically, GE's Tetra® PowerStrip LED sign lighting will be replacing existing fluorescent lamps in Public Storage's exterior signage, currently in place at over 2,000 locations. Public Storage approximates that there are up to eight of these exterior signs at each of its more than 2,000 locations, which cost the company up to \$1,000 per year per location to maintain including energy and upkeep. GE's LED lighting solution was selected due to its competitive price and improved light quality over fluorescent lamps as well as GE's reputation for being a stable, long-term technology provider. The deployment is expected to be completed within the next three to five years.

In addition to the energy costs savings, each Public Storage property is expected to reduce sign lighting energy consumption by 73% (based on a \$0.11 kWh electricity rate and 10 hours of use per day).

<http://finance.yahoo.com/news/public-storage-expects-pack-away-181500434.html>

**Harris & Harris Group (TINY-NASDAQ)**

*Harris & Harris Group Notes D-Wave Systems' New Equity Round of Financing*

Harris & Harris Group, an early-stage, active investor in transformative nanotechnology companies, summarized the announcement by D-Wave Systems, Inc., that it has closed a \$30 million round of equity funding with Bezos Expeditions and In-Q-Tel joining current D-Wave investors, including Harris & Harris Group, Business Development Bank of Canada, Draper Fisher Jurvetson, Goldman Sachs, Growthworks, International Investment and Underwriting, and Kensington Partners Limited. D-Wave will use the new funding to augment its commercial operations and further increase its capabilities to provide solutions to its customers through development of quantum computing applications.

<http://www.nasdaq.com/article/harris--harris-group-notes-d-wave-systems-new-equity-round-of-financing-20121004-00573>

**Itron, Inc. (ITRI-NASDAQ)**

*Itron Awarded One of the Nation's Largest Natural Gas Metering Contracts*

Itron announced that Southern California Gas Company (SoCalGas) expects to install nearly 1.5 million Itron gas meters and more than 600,000 gas regulators as a part of its advanced metering project to upgrade its natural gas metering system, with installation beginning in the fourth quarter 2012. The contract includes a minimum of 1.2 million residential gas meters, 200,000 residential curb meters, and 50,000 light commercial meters for accurate measurement of gas usage as well as 500,000 regulators and 105,000 curb regulators. The meter is a modern solution to curb metering as its design allows for more efficient deployment.

<https://www.itron.com/newsAndEvents/Pages/Itron-Awarded-One-of-the-Nations-Largest-Natural-Gas-Metering-Contracts.aspx>

**\*\*Johnson Controls Inc. (JCI-NYSE)**

*\*\*Johnson Controls Expands its Metals and Mechanisms Car Seat Plant in Mezolak, Hungary*

\*\*Johnson Controls announced that it had expanded its metals and mechanisms plant in Mezolak, Hungary. The new building is an important milestone in the success story of the plant and \*\*Johnson Controls in Hungary. In the last two years, \*\*Johnson Controls has created around 200 new jobs in its Mezolak facility and increased the number of employees there to more than 600. The plant will create an additional 50 jobs in the next six months. This plant manufactures metals and mechanisms for car seats such as height adjusters, latches and recliners. Customers are major global automakers.

<http://www.4-traders.com/news/Johnson-Controls-Inc-Johnson-Controls-expands-its-metals-and-mechanisms-car-seat-plant-in-Mezolak--15247981/>

**KiOR, Inc. (KIOR-NASDAQ)**

*KiOR Announces Participation in Fourth Quarter Investor Conferences*

KiOR announced that the Company will participate in the following upcoming conferences in the fourth quarter 2012: Goldman Sachs' First Annual Goldman Sachs Clean Energy Ecosystem Summit on October 11, 2012, in Menlo Park, California, and Bank of America Merrill Lynch's 2012 Global Energy Conference, November 13, 2012, in Miami, Florida.

<http://finance.yahoo.com/news/kior-announces-participation-fourth-quarter-130000398.html>

*KiOR to Participate in Mississippi Governor's Energy Summit*

KiOR announced that Fred Cannon, president and CEO, is participating in the Governor's Energy Summit in Jackson, Mississippi, hosted by Governor Phil Bryant. Mr. Cannon is participating on an Executive Roundtable Panel designed to outline the opportunities for Mississippi to enhance its growing energy sector. The presentation can be found on the Investor Relations section of KiOR's website.

<http://news.yahoo.com/kior-participate-mississippi-governors-energy-124500685.html>

**PPG Industries, Inc. (PPG-NYSE)**

*PPG Industries to Highlight New, Improved Family of Coil Coatings at METALCON 2012*

PPG Industries announced that it expects to introduce a new and improved line of coil coatings at METALCON International 2012 in Chicago, from October 9-11, 2012. On display is a next-generation DURANAR® coating, which has been reformulated with a lead-free composition, improved solar reflectance index (SRI), expanded color range, optimized primer, and other upgrades. The company will also display its expanded line of DURASTAR® coatings, including standard Durastar, Durastar SMP (silicone-modified polyester), and Durastar SMP ULTRA-COOL® coatings. METALCON 2012 also marks the debut of DURAFORM™ BP coatings, part of a new line of next-generation polyester coatings re-engineered by PPG to optimize performance characteristics for specific market applications. Duraform BP coatings are designed specifically for the building product market and feature enhanced UV durability and dirt resistance. The company's new and improved coatings will enable architects and building product manufacturers to obtain all their coatings solutions from a single supplier.

<http://www.4-traders.com/PPG-INDUSTRIES-INC-14090/news/PPG-Industries-Inc-PPG-to-highlight-new-improved-family-of-coil-coatings-at-METALCON-2012-%96-Com-15249098/>

**\*\*The Sherwin-Williams Company (SHW-NYSE)**

*SHW to Webcast Third Quarter 2012 Financial Results Conference Call*

\*\*Sherwin-Williams is scheduled to release its third quarter financial results (period ended September 30, 2012) prior to the opening of the market on Thursday, October 25, 2012. According to Yahoo! Finance, analysts' expectations are \$2.21 per share on revenue of \$2.66 billion, up from EPS of \$1.71 and sales of \$2.48 billion a year ago.

The company will conduct a conference call to discuss its financial results for the third quarter and first nine months, as well as detail its outlook for the fourth quarter and full year 2012, at 11:00 a.m. ET on October 25, 2012.

<http://finance.yahoo.com/news/sherwin-williams-company-webcast-third-151700045.html>

*\*\*Sherwin-Williams Reaches New 52-Week High*

\*\*Sherwin-Williams set a new 52-week high on Friday, October 5, 2012, with a share price of \$156.50, which exceeded the 52-week high of \$151 set by the company earlier in the week. Shares opened at \$155.10 on Monday, October 8, 2012. Average volume over the past three months has been 990,329 shares. SHW has nearly doubled in price over the past year, up from shares prices of roughly \$80 in October 2011.

\*\*Sherwin-Williams is a global leader in the manufacture and sale of paints, coatings, and related products. The company has developed innovative ways to make coatings that are compliant with today's most stringent regulatory requirements, offering a selection of products that meet new volatile organic compound (VOC) guidelines for industrial and architectural applications and offering products qualified for LEED projects. As well, the company has pioneered the use of renewable or sustainable raw materials in some formulations and uses blown-in-line colorant bottles that have less resin, save freight costs, and reduce hazardous waste. Part of its development efforts are directed toward embedding solar cells into paint, whether by developing these capabilities internally or acquiring the required technologies.

<http://www.thestreet.com/story/11726759/1/sherwin-williams-reaches-new-52-week-high-shw.html>

## Key Industry Developments

### *Popular Mechanics' 2012 Breakthrough Awards Recognize the Latest Technology/Product Innovations*

In early October 2012, *Popular Mechanics* released its eighth annual “Breakthrough Awards,” which seek to recognize the year’s most innovative and relevant new technologies. The magazine recognizes the top 10 innovations of the year, focusing on those that are smarter, safer, and more efficient than before, and the top 10 products of the year, which are thought to be setting new benchmarks in design and engineering. A selection of new technologies from the 2012 Breakthrough Awards is presented below. A full list of innovation and product winners can be found at <http://www.popularmechanics.com/breakthrough-award-winners>.

- An ultralight micro-lattice (metal mesh) that has been engineered to be 100 times lighter than Styrofoam packing peanuts and can be compressed by up to 50% yet still retain its shape when uncompressed. Its cellular architecture has a wall thickness of 100 nanometers, which is 1,000 times thinner than a human hair. The micro-lattice was developed by researchers at HRL Laboratories, LLC (a physical science and engineering research laboratory in California) and the University of California, Irvine. The new metal mesh is intended for use as a cushioning or insulating material and could have a range of applications from lightweight structures; battery electrodes; acoustic, vibration, or shock energy damping; cars and aircraft; to medical devices.
- IBM’s (IBM-NYSE) new supercomputer—officially the most powerful in the world—newly installed at Lawrence Livermore National Laboratory (LLNL) in Livermore, California. With a processing power roughly equivalent to that of two million laptops, IBM’s supercomputer is run by the U.S. Department of Energy to maintain the U.S. nuclear weapons stockpile and is also used by private companies for high-speed R&D.
- Self-inflating tires that manage their own air pressure from the Goodyear Tire & Rubber Co. (GT-NYSE). Goodyear has successfully tested prototypes and anticipates limited field testing in the fall of 2013.
- Solar shingles from the Dow Chemical Co. (DOW-NYSE), branded DOW POWERHOUSE™. These one-half-inch thick shingles incorporate a copper, indium, gallium, and selenide (CIGS) photovoltaic system covered with tempered glass that is designed to blend into the roof. The solar panels, illustrated in Figure 1, are durable and can be walked on or dropped from up to two stories.

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Figure 1  
DOW POWERHOUSE™ SOLAR SHINGLES



Source: The Dow Chemical Company's <http://www.dowpowerhouse.com/>.

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- Leap Motion, Inc.'s "Leap" computer peripheral device. At the size of a small iPod, Leap creates a 3D interaction space in front of a computer, allowing users to use their natural hand and finger movements to interact with and control what is on their computers. Available now on pre-order for \$70, Leap is believed to be 200 times more sensitive than existing touch-free products and technologies, and can distinguish finger (or pen) movements down to a 1/100th of a millimeter. Its market introduction may impact industries from gaming and design to surgery, architecture, and engineering.
- A 150-pound two-legged robot named MABEL that can walk with human-like dexterity built by scientists at the University of Michigan, Ann Arbor and Oregon State University. A walking robot could have use operating in hazardous environments where wheeled vehicles cannot maneuver, and work has already begun on refining MABEL into a lighter, faster model.
- A "grooved disc oil skimmer" designed for large-scale oil cleanup from Elastec/American Marine. The skimmer was created in response to the 2010 BP Deepwater Horizon spill, where petroleum had to be burned off the surface of the water rather than salvaged. The company's new grooved disc skimmer can collect 4,670 gallons of oil a minute with nearly 90% efficiency (thus, in an ocean environment, only 10% of the liquid collected would be water). It is scheduled for deployment by the end of 2012.
- A camera that sees around corners from the MIT Media Lab. It works by bouncing high-speed laser pulses off of nearby surfaces, such as walls, and then recording the pulses that reflect back in picosecond intervals.

<http://www.popularmechanics.com/technology/engineering/news/10-world-changing-innovators-for-2012>

#### *New Halogen-free Nanomaterials in Development as Fire-resistant Construction Materials*

Modern construction practices rely more on composite, juvenile lumber, and plastic materials than traditional stone or old-growth wood, as the new materials are lighter, more cost-efficient, and offer a number of other benefits. However, they are also more flammable. Based on data collected from the International Society of Fire Service Instructors (ISFSI), homes constructed with solid dimensional lumber may last 18 minutes to nearly 80 minutes before collapse. In contrast, modern lightweight construction could collapse in roughly 6 minutes to 30 minutes, providing significantly less time for firefighters to contain the fire. As a result, in 2009, there was an estimated \$7.6 billion in residential fire damage in the U.S., and over 78,000 firefighter injuries (Source: the National Fire Protection Association's [NFPA] *Fire Loss in the United States During 2009*).

Consequently, researchers from Spain's Tecnalia Corporation and its collaborators are developing new types of fire-resistant nanomaterials targeted for the construction and electricity sectors. In addition to incorporating fire retardant systems, these nanomaterials are stated to be halogen free and environmentally friendly. Halogen-free nanomaterials could be an important development, since the EU has recently stepped up restrictions on the use of halogen materials in construction due to their negative environmental impact. A Spanish consortium consisting of Tecnalia, Prolabin & Tefarm srl, Technika Plastica S.A., the Polytechnic University of Turin, and other companies is developing new polymers as substitutes for halogen materials, which can still be fire resistant and have the same mechanical properties as halogen additive.

<http://www.nanowerk.com/news2/newsid=26873.php>

*EU Commission Finds Existing Regulatory Framework to be Sufficient for Governing Nanomaterials*

The EU Commission has determined that nanotechnology is covered under the 2007 REACH chemicals regulatory framework, which was established to govern the safe use of chemicals (Registration, Evaluation, Authorisation, and restriction of Chemical substances). As such, the Commission plans to modify parts of the REACH legislation to include nanomaterials, as part of its assumption that the current legislative framework already covers, in large part, the risks posed by new nanomaterial developments. However, officials have noted the lack of comprehensive information that exists for the risks of nanotechnology and the need for case-by-case analysis. The European Chemical Industry Council (CEFIC) has stated its approval of the Commission's decision, believing that current regulations already ensure that nanomaterials are safely produced and used by companies and consumers—particularly as “nano” is only an indication of size not property, thus chemical regulations adequately cover these developments.

Regardless, not all European parties are satisfied by the Commission's view of nanotechnology regulation. The Greens in the European Parliament, as well as some consumer groups, do not believe that nanomaterials are comparable to normal chemical substances, and viewed this decision as a “lack of progress in improving transparency on nanomaterials and products.” Consequently, some European countries are implementing national registers for nanomaterials.

<http://www.euractiv.com/sustainability/greens-consumer-groups-rap-commi-news-515181>

*Nanocellulose May Enable the Manufacturing of New Environmentally Friendly Materials*

In October 2012, a doctoral candidate from Aalto University's School of Chemical Technology presented research finding that nanocellulose, or wood fiber broken down to the nanoscale, mixed with a polymer results in a tough composite material. This research asserts that the nanocellulose-based fiber could eventually replace the synthetic petroleum-based fibers that are presently used as reinforcement for composite materials/thermoplastics. As studied, such nanocellulose materials are renewable and could decompose in months into water and carbon dioxide in a natural compost environment. With further research, the study's author, Mindaugas Bulota, M. Sc. (Tech.), expects to be able to identify a “recipe” for manufacturing new, composite nanocellulose and poly(lactic) acid (PLA) polymers that are environmentally friendly, tough, strong, renewable, and potentially tailored to custom needs.

<http://phys.org/news/2012-10-nanocellulose-enables-environmentally-friendly-materials.html>

*Using Black Silicon to Capture the Full Solar Spectrum and Increase Solar Cells' Efficiencies*

A development in solar cell technology is to use black silicon in the solar cell's production. The benefit of black silicon is that it absorbs nearly all of the sunlight that hits it, including the hard-to-capture infrared radiation, versus conventional solar cells which can convert roughly 75% of the sun's spectrum but not infrared radiation. The assumption is that by irradiating standard silicon in a sulfur-containing atmosphere, solar cell manufacturers can equip their cells with black silicon and thus boost the cells' efficiencies by utilizing the sun's full spectrum. To this extent, researchers from the Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut (HHI), have recently announced that they managed to double the efficiency of black silicon solar cells by modifying the shape of the laser pulse used to irradiate the silicon. The scientists have successfully tested their black silicon solar cell prototypes, and now seek to merge this approach with commercial technology. The HHI researchers aim to increase the efficiency of commercial solar cells (currently approximately 17%) by 1% due to the use of black silicon. With further studies, it may be possible to create a system of algorithms that automatically determine how to modify the laser pulse in order to achieve optimal efficiency rates.

There are two commercial ventures possible based on this research: (1) merging the technology with standard silicon solar cells, which would enable a “tandem cell” containing both normal and black silicon; and (2) marketing the laser system used to irradiate the silicon so manufacturers can produce black silicon cells internally as an expansion on their existing solar cell production lines.

<http://www.fraunhofer.de/en/press/research-news/2012/october/solar-cells-made-from-black-silicon.html>

*Germany Illustrates Practical Success with a Reliable, Renewable Power Grid*

While there is commonly discussion of whether power grids can support renewable energies while maintaining reliability, experience in Germany is showing that they can. Germany’s smart grid has become one of the most reliable of the EU member states as well as one with among the largest shares of renewable energies feeding into the grid. As the number of operators/networks on the German grid increased over the past several years, the country’s grid interruptions have decreased due to good planning, according to data from Germany’s Federal Network Agency (Bundesnetzagentur). In 2011, there were only 15 minutes of unplanned interruptions on the grid versus France’s 62 minutes and the U.S. 240 minutes (outages that cost the U.S. roughly \$150 billion a year).

In terms of renewable power, German growth is outpacing the U.S. During 2011, Germany expanded the amount of renewable power accommodated by its grid from 20% to 25% in just a six-month timeframe. Much of this growth is due to solar power deployment, which expanded by 40% from June 2011 to June 2012. For comparison, Germany is believed to have installed as much solar capacity in the first half of 2012 alone as the U.S. has installed in total. Wind power is also widespread in Germany, accounting for over 9% of the country’s grid power.

In contrast, the U.S. grid is believed to require considerable smart grid upgrades as well as more transmission capacity in order to support similar levels of renewable energy. According to Smart Planet, the *Washington Post* recently reported that a “failure to modernize the U.S. grid will cost the U.S. \$71 billion in service interruptions alone by 2020.”

<http://www.smartplanet.com/blog/take/designing-the-grid-for-renewables/135>



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