



Representing the science center and museum field worldwide

## The ASTC “Energy Literacy” Project: A Sample of Current Science Center Offerings Worldwide

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### UNITED STATES

#### Arizona

##### **Arizona Science Center, Phoenix** ***Solarville in the APS Solar Gallery***

This new, eco-friendly gallery offers hands-on exhibits presenting solar energy in a whole new light. Step off the elevator and board the Solar Light Rail Station to begin your journey. Once in *Solarville*, you will stroll through scientific labs that are not only studying the sun, but also how we harness and distribute sustainable green energy—from algae, to alternative fuels, to poop! You will learn about cutting-edge technologies being implemented to address sustainable energy in businesses and cities around the world, and may lend a hand developing wind engine turbines and inventing new garbage waste systems. Explore ways in which you can utilize solar and renewable energy in your everyday life, from home appliances to harnessing the power of the changing seasons. Learn more about Arizona's most plentiful—and powerful—natural resource, the Sun. Visit: <http://www.azscience.org/solarville.php>.

#### Arkansas

##### **Museum of Discovery, Little Rock** ***Energy and Energy Transfer Sections of Discovery Hall***

Energy exists in many different forms and can be transferred from one form to another. Learn more in the following exhibits: *Energy Efficiency*: Pedaling a recumbent bicycle, visitors generate electrical energy to light an array of incandescent bulbs or an equivalent array of compact fluorescent bulbs. Switching between the lamp arrays demonstrates how much more efficient compact fluorescent lamps are than incandescent lamps; *Design a Wind Generator*: Design and build a propeller for speed and power by choosing blade shape, number of blades, and angle of attack, then measure its success by the electrical output produced by a signal generator; *Solar Energy*: Move a solar panel to the different angles of the sun during the summer solstice, winter solstice, and equinox in Arkansas to learn how to maximize the amount of energy it can generate; *Water Turbine*: Pump a lever to raise water into a tank; upon release, it flows onto a turbine wheel, generating electricity. The higher water level increases the pressure, which, in turn, increases the amount of electricity generated; *Electricity Bench*: Explore the science behind electrical components and circuits with easy-to-assemble electrical circuits built into "dog bone" assembly blocks that attach end-to-end via magnets; *Electric Motor*: Explore the behavior of both permanent magnets and electromagnets and their connection to electricity; *Electric Generator*: While motors transform electrical energy into mechanical motion, generators convert that same push of mechanical motion into electrical energy. In this exhibit, visitors turn a handle to spin the rotor to create electricity and, "see" the electricity produced by switching on a light bulb and/or fan connected to the generator. Visit: [www.museumofdiscovery.org](http://www.museumofdiscovery.org).

# California

## **California Academy of Sciences, San Francisco**

### ***Building Green***

Buildings are responsible for 40% of all energy consumption in the United States, so making them more efficient is a critical step towards a better future. So how do green buildings work? At the California Academy of Sciences, visitors can answer that question while exploring the building's *Building Green* exhibit and its "Living Roof." The Academy building is an excellent example of cutting-edge, green design, conserving energy while housing an internal rainforest, planetarium, museum, and aquarium. At the *Building Green* exhibit the public can learn more about the specific design features that help the building function, they can touch physical examples of green technology, and they can learn how to apply similar principles in their own homes and offices. On the "Living Roof" they can get a close up look at the Academy's solar panel array, and learn how a living roof makes a building more efficient. Visit:

<http://www.calacademy.org/academy/building/>.

## **California Science Center, Los Angeles**

### ***Clean Power: Fuel Cells in Transportation***

This is an exhibit at the California Science Center focusing on fuel cell technology and its uses in transportation. Through hands-on activities, 3D animation, and a life-size modified Toyota Prius, visitors find out how fuel cells work, how they can benefit the environment, and discover the challenges that will need to be met before fuel cell transportation gets the green light for consumers. This exhibit is part of the Transportation section of the "Creative World" permanent gallery at the California Science Center. It includes several components, including: (1) *Fuel Cell Q & A*: This is an interactive module where visitors get answers to some frequently asked questions about fuel cells, such as What is a fuel cell? and What's it like to drive a fuel cell car?; (2) *The Promise of Fuel Cells*: This multimedia program explains, through 3D animation, how fuel cells convert chemical energy in a fuel into electricity, the history and future of fuel cell technology, and what the wide use of this technology would mean for California; (3) *Interactive Fuel Cell Model Car*: This interactive scale model of a fuel cell car helps visitors identify its different components, their specific function, and how they all work together to make it run; and (4) *Comparison Sticker*: Visitors can see how a fuel cell car measures up to the fuel efficiency and emissions of a standard gas burning car or a hybrid gas/electric vehicle. Visit:

<http://www.californiasciencecenter.org/Exhibits/CreativeWorld/Transportation/FuelCell/FuelCell.php>.

## **Chabot Space & Science Center, Oakland**

### ***Bill Nye's Climate Lab***

Changing the world is fun in *Bill Nye's Climate Lab*, powered by the renewable energy of kids. Games to play! Levers to pull! Avatars to create! Parents to educate! Collect "solutions" on your personalized "Climate Scout" ID badge throughout Bill Nye's Climate Lab and help thwart climate change! Try these activities: Generate electricity with a wind-powered turbine; Jump on a bike and ride along with Bill Nye on a journey to reduce greenhouse gasses; Climb into a hot air balloon for a unique view of our thin, fragile atmosphere; Create hydro energy and power a lighthouse; Trek into the forest, become a citizen scientist and study how climate affects trees and animal migration; Learn how biofuel can be made from plants; Dive into the underwater observatory and experience the changing ocean currents and their influence on ice sheets and sea life; Look through the window of the future to design buildings using climate-friendly materials that save energy and money; and Become a climate scientist as you study ice and mud cores from ancient times. In *Bill Nye's Climate Lab*, it all comes down to Earth—as a "Climate Scout" you'll explore, innovate, advocate, and change the world! Visit:

<http://www.chabotspace.org/bill-nye-climate-lab.htm>.

## **Ruben H. Fleet Science Center, San Diego**

### ***So WATT! An Illuminating Look at Energy***

*So WATT! An Illuminating Look at Energy* is a new hands-on exhibition focusing on electricity production, alternative sources of energy, and basic conservation strategies you can try at home and at work. *So WATT!* features five interactive exhibits, including a touch-screen interface where you can monitor electricity being generated by 10,000 square feet of solar photovoltaic (PV) panels on the roof of the science center. Owned and operated by SDG&E, the PV system is capable of generating more than 100 kilowatts (kW) of electricity at peak production for San Diego's power grid. Generate your own electricity

at the *Make a Watt* exhibit and learn how much energy it takes to produce a watt. At *Watt's the Difference?* you will learn more about the six most common ways electricity is produced—fossil fuels, nuclear, hydroelectric, geothermal, wind, and solar—then find out where most of California's power comes from. Every form of energy production has pros and cons, and after learning a bit about these impacts, you'll have an opportunity to vote for the energy source YOU think should be used most for generating electricity in the next 20 years. Ever wonder how solar panels work? At the *Watt's in the Sun?* exhibit, solar power is demystified with a down-to-earth explanation of how PV panels produce electricity from sunlight. You can be a solar engineer at this exhibit by adjusting a small PV panel, lining it up with a light source and creating enough electricity to power a small fan. Nearby, an interactive touch-screen exhibit called *Watt's on the Roof?* lets you investigate real-time and historical data on how much electricity is being produced by the Fleet's rooftop PV system. *Watt about Me?* is an interactive exhibit that demonstrates a wide variety of simple ways to conserve electricity at home and at work. By flipping switches on a scale model of a "typical house," you'll discover how the energy consumption level changes as you implement various conservation measures. Visit:

[http://www.rhfleet.org/site/exhibition/so\\_watt.cfm](http://www.rhfleet.org/site/exhibition/so_watt.cfm).

## Connecticut

### Connecticut Science Center, Hartford

#### **Energy City**

Solar panels. Wind turbines. Hydropower. Fuel cells. Biomass products. These are just a few of the alternative energy technologies you can try out in this exhibit. Play "energy watt" pinball. Calculate your personal carbon footprint. Add up the savings of certain "smart energy" behaviors. Tour virtual town settings to measure the effect of our "energy" usages and how they impact the triple bottom line of people, planet, and profits. *Energy City* has been funded by the Connecticut Clean Energy Fund and the Connecticut Energy Efficiency Fund. Technical support has been provided by the National Renewable Energy Laboratory, a U.S. Department of Energy Laboratory. Visit:

<http://ctsciencecenter.org/exhibits/energy-city/default.aspx>.

### Discovery Museum and Planetarium, Bridgeport

#### **Energy Gallery**

The Discovery Museum's *Energy Gallery* features four stations with interactive dioramas and videos where visitors learn the sources of our energy: fossil fuels and three renewables – solar, wind, and hydroelectric. As visitors energize the dioramas, they trigger videos, and add power to the overhead *SmartGrid*. In the *SmartLiving House*, they choose between conventional and EnergyStar-rated household appliances to see how much they could save with efficient appliances. Videos also explain energy conservation topics such as insulation. This exhibit was made possible by the Connecticut Energy Efficiency Fund. Also featured in the *Energy Gallery* are a kiosk where visitors can learn about the Museum's solar array and see how much energy it is producing in real time; a human-powered generator where visitors get to experience how much effort it takes to power light bulbs and play a radio; and our Solar LEGO™ station, where visitors build solar-powered cars and other creations. The Discovery Museum is investigating possibilities to add wind power, geothermal, and hydroelectric facilities to our gallery via real-time links to active power-generating sites. Visit: <http://www.discoverymuseum.org/museum/museum/exhib/perm.html>.

### Stepping Stones Museum for Children, Norwalk

#### **Energy Lab**

Hands-on, kid-powered learning! The exciting and all-awesome *Energy Lab* is a wet, wild, and wonderful way for children to learn about the science of energy. As they use their boundless energy to explore the million-dollar exhibit, they'll find a "working lab" that inspires a natural curiosity to imagine and invent. In the *Solar Lab*, it's hot, it's bright, it's one of the strongest sources of power in the solar system. Explore solar power and learn how to use the sun's energy to generate electricity and heat things up! In the *Potential Energy Platforms* area, climb the platforms to increase your potential energy and gain a birds-eye view of *Energy Lab*. Cranks, levers, air tubes and blowers set balls and objects into motion and young minds into action. In the *Wind Lab*, hold on to your hat! Feel the wind in your face and behind your back. A giant wind tunnel reveals the force of wind and how we can use it to make amazing things happen. The *Water Lab* is wild and wet. Waterfalls, basins, funnels, and water wheels entice children to pump, push, turn, and direct water to perform everyday activities. As they explore hydropower, children will understand how water can make things move to generate electricity. In the *Coal, Oil, Natural Gas and*

*Uranium Lab*, get on down and crawl below the surface of the earth to see where coal, oil, natural gas, and uranium come from. Learn about the impact these resources have on our everyday lives and why they are limited. An immersive, wet, and windy environment sets the stage for children to learn about the science of energy—sources, uses, and emerging alternatives—and it is designed with a lab theme, offering a futuristic view to inspire children’s natural curiosity to explore and invent. Water, wind, and sun offer opportunities for children to explore new ways to generate electricity and conserve resources. Outdoor exhibit components and interactive sculptures introduce energy transformation principles using renewable energy. Over 300,000 children, families, and school groups are expected to visit the exhibit each year after the expanded new museum opened in November 2010. In conjunction with the exhibit, the museum offers extensive on-site, school and, community programming. Visit:

<http://www.stepsstonesmuseum.org/Exhibits/EnergyLab/tabid/183/Default.aspx>.

### **Stepping Stones Museum for Children, Norwalk (developer)**

#### **Currently Featured at the Delaware Museum of Natural History (Wilmington, DE)**

##### ***Conservation Quest/Power Play***

The exhibit was developed to create a highly interactive, hands-on way for visitors to learn the power of making smart energy and conservation choices. Visitors are encouraged to explore ways to save with light bulbs, electricity, and recycling. They are introduced to solar, wind, and hydropower, and can play with circuits to power lights, radios, and fans. Features include: *How Do You Stack Up?*, where visitors stack blocks sized to represent the amount of electricity various appliances use and determine how much electricity their family uses each day. You can play again and again, changing simple things to try and use less electricity. Learn how much electricity families use, and find ways to use less; *Watt's the Use?*, where visitors can turn on different electronics and use the attached watt meters to display their electricity use. You can also compare electricity use between different items that do the same thing—which uses less: a clothes dryer versus a clothesline?; *Bright Ideas*, where visitors can turn a crank to compare the amount of energy required to light up an incandescent light bulb, a CFL, and an LED. Learn about which is more efficient, the cost of using each bulb, how long they last, and disposal and conservation tips. This fun interactive lets you FEEL the difference in energy use between the three different light bulbs!; *Sort The Waste*, where visitors learn about where waste goes while sorting two-dimensional items into their proper containers: plastics, glass, paper, metals, garbage, compost, donations, and other. Learn how much waste the average person produces, or how we can generate electricity from trash; *Connect It!*, where visitors can create a circuit to power LED lights, fans, and alarms. You'll explore wires and electrical devices, create a circuit, and understand what electricity is and where it comes from. Learn to identify the parts of a circuit, understand how electricity travels, and how to conserve electricity!; *Clean Energy*, where visitors explore how water, wind, and solar energy are used to generate electricity and turn on different electronics. Visitors learn specifics about wind turbines, hydropower dams, and solar panels; and *Map of the World*, where visitors explore which countries use the most energy around the world, what sources we use, and for what purposes, using a map and graphs. Visit:

[http://www.delmnh.org/special\\_exhibits\\_conservationquest.php](http://www.delmnh.org/special_exhibits_conservationquest.php).

## **District of Columbia**

### **Koshland Science Museum**

#### ***Earth Lab: Degrees of Change***

In the *Earth Lab: Degrees of Change* exhibition at the Koshland Science Museum, visitors examine the energy sector and employ strategies to lower carbon dioxide (CO<sub>2</sub>) emissions to a level that will significantly reduce the impact of climate change. Participants take on the role of policy maker in this simulation game and decide which actions align with priorities they value, then compare their plans with those of other players. By assessing the impact of various energy sources, visitors understand the tradeoffs implicit in mitigation strategies and see how their choices influence the outcome. Visit:

<http://www.koshland-science-museum.org/index.jsp>.

## **Florida**

### **Florida Museum of Natural History, Gainesville**

#### ***Our Energy Future***

The Florida Museum of Natural History celebrates its rooftop solar array with the exhibit *Our Energy Future*. Step into the exhibit as though entering a room in a home. Inside, find creative hands-on

experiences that teach about energy use and ways you can make changes in your own home to save energy and money. Learn how Floridians use energy, what renewable energy technologies mean for Florida, and how personal behaviors can make a huge difference. Visit:

<http://www.flmnh.ufl.edu/energyfuture/>.

### **Museum of Discovery and Science, Fort Lauderdale** ***EcoDiscovery Center***

The Museum of Discovery and Science recently opened a \$25 million expansion featuring many exhibits that focus on climate change and renewable energy. *Go Green!* focuses on recycling and conservation and includes exhibits on measuring visitors' carbon footprint and on solar and wind power. *Storm Center* and *Prehistoric Florida* include exhibits demonstrating how climate change is affecting – and will affect – Florida, through exhibits about sea level rise and water resources. The museum is currently working with the City of Fort Lauderdale to deliver "Smart Watts" home energy savings workshops and toolkits to reduce home energy use to 1300 households in Fort Lauderdale. Visit:

<http://www.mods.org/exhibits/discovery.htm>.

### **Museum of Science and Industry, Tampa** ***Solar Array and New Projects***

The Museum of Science and Industry (MOSI) is the location for a 15,000-watt solar p.v. array. Tampa Electric Company (TECO) owns the array, and the electricity collected is fed back into the grid. TECO provided funding for interpretive panels and an interactive station that displays current energy being generated, along with hands-on solar panels where guests' shadows can interrupt the current flow to a small motorized display. MOSI has sought and is pursuing other funding for future exhibits on alternative energy to help guests make sense of the confusing array of alternative energy sources, and the pros and cons for each. Because the scale of such projects may be overwhelming to many, they are planning specific exhibits on alternative fuel cars, something everyone can relate to. MOSI also plans to showcase battery storage, which may be a bigger issue than generating power. In addition, MOSI is seeking funding to add a massive solar array to the slanted roof of one of their buildings to generate power for the museum campus. Visit: [www.mosi.org](http://www.mosi.org).

### **Miami Science Museum, Miami** ***Energy Tracker***

Throughout all of the Miami Science Museum (MiaSci) is an ever-growing interconnected trail of hands-on exhibits that explore everything from basic energy principles to the future of renewable energy. The exhibition is part of MiaSci's ongoing effort to prepare for its move to downtown Miami, where the largest exhibition will be the building itself, a three-story showcase of renewable energy technologies. *Energy Tracker* was made possible through support from the U.S. Department of Energy and the City of Miami, and features the *Energy Dance Floor*, *Energy Jam* workshop gallery, *Energy Garden*, and *Fuels of the Future* exhibit, as well as a wind turbine and a green roof. Visit:

<http://www.miamisci.org/www/energytracker.html>.

## Illinois

### **Museum of Science and Industry, Chicago** ***Future Energy***

The Museum of Science and Industry (MSI) is scheduled to open a new, \$7 million permanent energy exhibit entitled *Future Energy* in the fall of 2013. The centerpiece of the exhibit is a real-time, 3-dimensional, 30-participant simulation activity where school groups and the audience at large have an opportunity to design and envision Chicago's energy future. The simulation experience puts visitors into various roles (e.g., scientist, engineer, designer, urban planner) and challenges them to experiment with and create innovations that contribute to Chicago's future energy landscape. The real-time results are aggregated on a large digital "scoreboard" and displayed in real-time, in a collaborative as well as competitive setting where individuals and teams are scored for their innovations. The simulation culminates in a visually rich and dynamic vision of a new energy landscape for Chicago! In addition to the simulation activity, the exhibit includes the *Energy Garden* – a playful, kinetic, sensory experience in which visitors use their bodies and collaborate with others to create amazing visual and physical outcomes that celebrate the fundamental principles of energy. Preceding the simulation activity, the exhibit presents a brief film, *The Audacious Story of Energy*, which conveys the extraordinary feats of engineering,

technology, and human ingenuity inherent in the production and distribution of energy around the globe on a 24/7 basis! The exhibit concludes with a large, multi-touch table where visitors can explore the distribution and scale of energy resources around the United States (including wind, solar, geothermal, biomass, nuclear, coal, natural gas, and petroleum); the important role that geology and geography play in the energy equation; and the vast and visually amazing network of distribution infrastructure around the country. MSI's partnership network extends throughout the country and includes Argonne National Lab, Rocky Mountain Institute, the Clean Energy Trust, the Galvin Electricity Initiative, the Illinois Institute of Technology, Exelon, Ford, BP, and many others. Visit: <http://www.msichicago.org/>.

## Indiana

### **Science Central, Fort Wayne**

#### ***Future Exhibit***

Science Central is a regional resource that provides inspiring and fun hands-on science education for people of all ages. The facility opened November 5, 1995 in the 1929 City Light and Power Plant; a future exhibit will allow visitors to be the engineer and generate electricity for the City of Fort Wayne by firing up the boiler, producing steam to spin the turbine, synchronizing the generator, and then sending power to the City. Visit: [www.sciencecentral.org](http://www.sciencecentral.org).

### **Terre Haute Children's Museum, Terre Haute**

#### ***Energy Generation Station, Energy Zone, and One Planet Solar***

Try out your energy generating skills at the *Energy Generation Station* on the second floor. Attempt to "Follow the Sun" as light moves from one solar panel to the next. If you can keep up, you'll reap the rewards of lighting the entire building (model) with the energy you've conserved! Next, hop on the bike seat and pedal as fast as you can to try to generate enough energy to light the building. Or, create wind energy by choosing from three differently shaped fan blades to attach to the "windmill." Experiment with different shapes, angles, and combinations of blades to discover which will spin the fastest. Maybe you can race your friends to see who contains enough energy to light the building first! Next, learn about water energy by visiting the water table, equipped with dams, fountains, an Archimedes Screw, and pipe fittings. Test various positions and designs with the dams to gain a better understanding of how hydroelectric power plants function. And you won't want to leave the *Energy Zone* without visiting the *One Planet Solar* exhibit, where you'll see exactly how much electricity the five-panel solar array on the back of our building is producing. Here you'll find helpful illustrations of how solar power is actually helping us save on electricity in our facility! Visit:

[http://thchildrensmuseum.com/index.php?option=com\\_content&view=category&id=27&layout=blog&Itemid=27](http://thchildrensmuseum.com/index.php?option=com_content&view=category&id=27&layout=blog&Itemid=27).

## Kansas

### **University of Kansas Natural History Museum, Lawrence**

#### ***Educational Materials***

The University of Kansas Natural History Museum offers a variety of educational material related to energy: a new program for schools called the *Cartoon Guide to Energy*, and suite of online materials about energy on the Quarked! website, including the "Photon Invaders" game about solar panels and "Science Shorts" videos about energy. Visit:

<http://naturalhistory.ku.edu/sites/default/files/schoolflyer2012.pdf>, [www.quarked.org](http://www.quarked.org), and <http://www.quarked.org/scienceshorts/>.

## Kentucky

### **East Kentucky Science Center & Planetarium, Prestonburg**

#### ***energee!***

This highly interactive exhibit consists of 10 kiosks plus an introductory "What is Energy" and "The Future is Now" wall. Visitors are introduced to energy concepts including topics on coal, natural gas, potential and kinetic energy, light, thermodynamics, atmospheric gases, generating electricity, and energy conservation. Although focused on students in grades 5-9, both younger and older audiences will find both fun activities and also challenging science questions to investigate. Each of the individual exhibits has a

gee! panel with "fast facts" about the particular energy topic along with careers related to specific topics. With the uncertain future of energy sources in the world, this exhibit fills a critical need for public understanding of energy concepts.

## Louisiana

### **NRG! Exhibits (developer)**

#### **Recently Featured at Sci-Port: Louisiana's Science Center (Shreveport)**

##### ***Sustainable Choices***

Sustainability, which is usually defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs, is the topic of *Sustainable Choices*, the latest traveling exhibit housed in Sci-Port's REGIONS Exploration Gallery. With the tag line, "Living today with tomorrow in mind," the exhibit answers questions such as: What is sustainability, and what does the word sustainable mean? Why would one think that living sustainably would be important? What are the benefits of maintaining a sustainable lifestyle? Who will be most affected by it, and when? *Sustainable Choices* examines the issues involving laundry, recycling, composting, light bulbs, and transportation, and explains how to calculate your carbon footprint. While all choices have environmental trade-offs, this hands-on interactive exhibition can help visitors of all ages make informed decisions about how to live more sustainably. In addition to "Reduce, Reuse, Recycle," *Sustainable Choices* invites visitors to "re-think," too. Visit: <http://www.sustainablechoicesexhibit.com/> and <http://www.sciport.org>.

## Maryland

### **Maryland Science Center, Baltimore**

#### ***Energy Efficient Car – Today and Tomorrow***

Find out what's possible, what's practical, and what's happening right outside the Science Center's doors with this exhibit featuring a hands-on exploration of alternatives to gasoline powered vehicles. Exhibit highlights include a full size, see-through automobile, kids' car construction tables and computers, and a look at the car of the future and today's technology advances. A full size, see-through automobile is the highlight of the exhibit supported by touch screen interactives highlighting today's technological advances and how they make your car more energy efficient. See how plastics have replaced steel in many car parts giving up unnecessary weight but in many cases increasing safety and efficiency. Get a glimpse into the next wave of alternate fuel transportation with an in-depth look at lithium ion battery technology used to power our very own fleet of 100% electric vehicles—altcar! Visit: <http://www.mdsci.org/exhibits/energyefficientcar.html>.

## Massachusetts

### **EcoTarium, Worcester**

#### ***Future Exhibit: Energy Trail***

As part of the EcoTarium's plan for the museum's third century, The Third Century Plan includes an outdoor energy trail exhibit integrated into the museum's 55-acre Central Massachusetts campus. The energy trail exhibit uses the museum's low carbon emission, gas fired co-generation plant as the foundation for the exhibit. Additions of wind, solar, geothermal, fuel cell, and bio mass power generation would provide guests the opportunity to experience and learn about these alternative energy sources on a scale used in a private home. Currently, the EcoTarium is in the process of collecting wind data on an anemometer and investigating avenues to potentially sell power back to the grid. Visit:

<http://www.ecotarium.org/>.

### **Museum of Science, Boston**

#### ***Wind Turbine Lab/Catching the Wind Exhibit***

In 2009, the Museum of Science installed a rooftop Wind Turbine Lab with five different types of small-scale turbines. Wind turbines generate electricity without creating pollution; wind as a "fuel" is clean, renewable, free, and available world-wide. The lab feeds live data to the exhibit *Catching the Wind*, where visitors learn about our wind turbines and energy technology. The lab is also an independent, real-world test facility for small-scale wind turbines in an urban environment, providing solid data and project experience for professionals, universities, government, and consumers. Annually, these wind turbines produce 60% of the electricity needs of an average Massachusetts home. In *Catching the Wind*, visitors

can dive into the world of wind turbines, learning how they generate electricity from the power of the wind, what sorts of factors need to be considered when selecting and siting a turbine, and what trade-offs we make when choosing any energy source. Visit:

[http://www.mos.org/exhibits\\_shows/current\\_exhibits&d=1215](http://www.mos.org/exhibits_shows/current_exhibits&d=1215).

### ***Energized!***

This new hands-on exhibit introduces visitors to the possibilities and complexities of renewable energy via interactive components, models, videos, and other displays. The exhibit starts in the main lobby with an energy tree where visitors generate energy that accumulates to turn iridescent leaves. The theme of *Energized!* is choices and tradeoffs: it takes a mix of energy sources to power our world. The focus is on sunlight, wind, hydropower, and other renewable sources and what some of the challenges are in using these sources versus fossil fuels and nuclear power. Examine live data to find out how the array of photovoltaic panels on the Museum's roof offsets the power consumption of the Museum's iconic Theater of Electricity. Experiment with optimal placement of solar panels on the roof of a house; focus sunlight with mirrors on the solar collector; examine models of solar collectors; and discover the mix of energy sources that lights up the city of Boston! Learn about innovations from regional companies that are finding ways to make use of untapped energy sources. Visit: <http://www.mos.org/energized>.

### ***Current Science & Technology Presentations***

The Museum offers a variety of energy-related presentations on their live stage, including in-depth explanations of the following technologies: (1) *Alternative Energy*, where audiences investigate wind, solar, and nuclear power, as well as hydrogen, ethanol and biodiesel fuels; (2) *The Future of Nuclear Energy*, where audiences learn how a nuclear reactor works, explore some of the tradeoffs surrounding nuclear energy, and hear about how scientists are engineering a new generations of safer, more efficient plants, such as pebble bed reactors and the Next Generation Nuclear Plant in Idaho; and (3) *Tiny Solutions to Our Big Energy Problem*, where audiences learn about where our energy comes from, which energy sources are running out, and how nanotechnology is helping us find cleaner, safer, and renewable sources of energy to fuel our future. Visit: <http://www.mos.org/topics/cst>.

The Museum of Science also offers energy-related podcasts, energy-related curriculum published by the National Center for Technological Literacy at the Museum of Science, and has hosted a Renewable Energy Fair.

## **Michigan**

### **Ann Arbor Hands-On Museum, Ann Arbor**

#### ***Various Energy Exhibits***

Ann Arbor Hands-On Museum has a series of energy exhibits, which together they form a sizable footprint: *Waste 2 Watts* explores the recovery of landfill gas and discusses the solid waste stream. The exhibit consists of several interactive exhibits, a model of a landfill, and wall panels. *Hydrogen Fuel Cell* engages guests to understand the process through an interactive video experience that allows for customization of the hydrogen cycle. *Solar Cities* is a suite of exhibits that explores solar energy and efficiency. These exhibits are designed to travel to schools throughout our region in conjunction with the City of Ann Arbor's national solar cities designation. *Solar Cell* is in development now, as the museum is installing an interactive monitoring station in our downtown Farmers' Market, where one of the shed roofs is covered in photovoltaic cells. With the *Solar Hot Water Heater* installed in conjunction with a neighboring fire station, the museum monitors their solar hot water heater. Visit:

[www.aahom.org/exhibits/energy](http://www.aahom.org/exhibits/energy).

## **Minnesota**

### **Duluth Children's Museum, Duluth**

#### ***Clyde Park Development Project***

The Duluth Children's Museum has plans to relocate to an existing 80-year-old building located off I-35 in a former industrial brownfield site. The overall development project, called Clyde Park, is fast becoming a local destination for the community. In acquiring the building, the Children's Museum's LEED, AP architect, John Erickson (dsgw) and construction management company (Kraus-Anderson Construction) secured a wind turbine for the museum's rooftop. While the specific application has not been defined, the wind

turbine is designed to be an integral component in a green teaching and learning rooftop. The turbine will be educational in that it will define in a windy location just how much energy can be generated and what can it power. As recent graduates of the Sustainable Twin Ports, the Duluth Children's Museum leadership participated with members of each organization located in Clyde Park and jointly committed to developing sustainable practices to reduce their carbon footprint and to develop educational signage throughout their spaces on the impact of our energy decisions. Visit: [www.duluthchildrensmuseum.org](http://www.duluthchildrensmuseum.org).

## **Science Museum of Minnesota, St. Paul**

### ***Exergy***

Exergy (also known as advanced heat recovery) is the portion of the total energy of a system that is available for conversion to useful work. Buildings typically apply only a small portion of available exergy to their total facility energy demands because the heat generated as a byproduct of internal processes is seldom captured for other useful work. Instead, high-quality energy sources such as electricity and fossil fuels are commonly used to satisfy low-quality energy heating and cooling demands when in fact many buildings could meet most of these needs through the capture and reuse of waste heat. The application of exergy to commercial and industrial enterprises have yielded startling reductions in energy consumption and greenhouse gas emissions with rapid returns on investment. With support of a major utility partner, the Science Museum of Minnesota (SMM) recently completed an exergy analysis of its facility. SMM now is in the process of implementing the exergy recommendations, developing exergy exhibits and programs, and becoming a highly visible exergy case study.

### ***Energy Innovation Corridor (EIC)***

The EIC is a clean energy and transportation showcase along the 11-mile Central Corridor light rail corridor from downtown St. Paul to downtown Minneapolis via the Minnesota State Capitol and the University of Minnesota. The EIC will advance local, state, regional, and federal efforts to invest in alternative and renewable energy, address global climate change, and create new jobs through the creation of a sophisticated energy and transportation infrastructure system (e.g., distributed renewable energy, advanced energy efficiency programs, electric transportation, and smart grid technologies). The EIC will be a national model for the future development of other transportation and energy corridors. As a member of the EIC, SMM will serve as a demonstration site for EIC innovations where and when possible and will develop exhibits through which EIC innovations can be made accessible and relevant to citizens and policymakers.

### ***Future Earth Initiative***

Over the past several decades, numerous independent lines of research conducted by thousands of scientists around the world (including work by SMM scientists) have accumulated into a scientific body of evidence documenting that humans now are the dominant agents of global change. *Future Earth* is a major SMM program theme to keep the museum and its audiences (locally, regionally, and nationally) on the leading edge of the science of global environmental change. Global change issues can be contentious and controversial. A fundamental first step for *Future Earth* is contributing toward a broader societal realization that humanity has crossed a major threshold from being merely an inhabitant of Earth to being its leading architect. *Exergy* and other energy innovations will be significant elements in the *Future Earth* exhibit that opened in April at SMM. Visit:

<http://www.smm.org/exhibitservices/history/futureearth>.

### ***Science House***

This 1,690-square-foot building is located in SMM's outdoor science park, the Big Back Yard, and is home to its Teacher Resource Center. Designed, built, and operated to work as a zero-emissions building, 10.2 kW of photovoltaic film adhered to the metal roofs of the building and the adjacent shed make electricity from the sun. This electricity, in turn, powers a ground-source heat pump to heat and cool the building. Energy-efficient windows and doors and wall insulation are combined with passive solar heating and careful lighting design. *Science House* runs entirely on electricity. It produces more electricity than it uses from April through October. It then consumes more than it generates from November through March. When the deficit from winter is added to the surpluses of spring, summer, and fall, *Science House* generally produces more electricity than it uses on an annual basis. *Science House* serves as an ongoing test of energy efficiency and renewable energy technologies. In September 2009, 3M installed a 0.8 kW PV tracking array near *Science House* to test its new solar-concentrating film.

## New Jersey

### Liberty Science Center, Jersey City

#### ***Energy Quest***

How will we power our futures? How can we balance our ever growing energy needs with environmental impacts? *Energy Quest* examines the five major sources of Earth's energy in search of the answers. Learn how we explore and harness these energy sources at activity-filled, hands-on stations. Join the exploration and experiment as a geologist, oceanographer, chemical and nuclear engineer, and more. *Energy Quest's* five energy themes are: Surface (wind, solar, hydro); Bio-Stored (oil, coal, natural gas, bio-mass); Nuclear (fission, fusion); Ocean (waves, tidal, ocean-thermal); and Geo-Thermal (hydro-thermal, hot dry rock, magma). Exhibition highlights include: the *Tidal Station*, where timing is everything. Experiment with rising and falling tides as you open and close valves to release a gush of water collected in a reservoir through a turbine. As the wheel spins, check out the meter and observe how much power is generated; the *Biofuel Station*, where you'll learn about hydrocarbons as you build and take apart three-dimensional molecular models; the *Oil Drilling Station*, where you'll search for oil. If you want to hit a gusher, you'll have to study the rock formations below ground and figure out the best place to drill; the *Plasma Station*, where you'll see how plasma—the superheated ionized gas found on the sun—is shaped as it flows through a vacuum chamber. There, you'll discover that plasma is not only important for nuclear fusion research, it's also found in some common items like fluorescent lights and neon signs. This component was created by the Princeton Plasma Physics Lab; finally, young visitors will be blown away at the *Wind Station* when they use air tubes to make a set of wind turbines spin and see what happens when solar panels are covered by handheld "shadows." Visit:

<http://lsc.org/see-whats-happening/current-exhibitions-and-experiences/energy-quest/>.

## Missouri

### Saint Louis Science Center, Saint Louis

#### ***EVie the Electric Vehicle***

EVie, the newest exhibit at the Saint Louis Science Center, is an electric truck full of new, interactive exhibits to help people learn about energy basics, electric vehicle technology, and related environmental concerns. EVie is part of a larger exhibit currently being developed on energy to open in 2012. While EVie travels around the Saint Louis area visiting schools and attending fairs and festivals, her home base is the Saint Louis Science Center. She has her own special parking space there, complete with a charging station. Interested in finding out where EVie is? Just check the calendar on her website! EVie is sponsored by the Saint Louis Science Center, Missouri University of Science & Technology, AmerenUE Pure Power, French Gerleman, Microgrid Energy, and Innoventor. Visit: <http://stlenergy.org/> and

<http://www.slsc.org/GeneralInfo/EVie.aspx>.

## Nevada

### Terry Lee Wells Nevada Discovery Museum, Reno

#### ***Build It!***

*Build It!* brings Nevada's vast solar and geothermal energy resources indoors and puts their power into the hands of young people. Visitors learn all about the growing green industry in Nevada with exhibits focused on wind, solar, and geothermal energy. Using a state-of-art virtual simulator, children can design their own houses and see how building choices such as type of insulation, windows, water heaters, and landscape affect both short-term and long-term costs for the homeowner and the environment. *Build It!* allows visitors to explore repurposed and recycled building materials—visitors are often surprised by how much style can be found in a material that would otherwise be considered trash. Finally, children work collaboratively to create alternative energy which powers a model of the City of Reno's welcome sign. This exhibit is empowering, fun, and gives Nevada residents a sense of place. Currently in construction is the museum's newest interactive exhibit that links the energy generated from the 196 solar panels located on the roof of the facility as well as from their 30-foot wind spire to a computer interface so visitors can see how we can use these readily available energy sources in our location. This gallery would not have been possible without the support of Nevada Energy. Visit:

[http://www.nvdm.org/learn\\_explore/galleries\\_buildit.php](http://www.nvdm.org/learn_explore/galleries_buildit.php).

## New Mexico

### **Explora, Albuquerque**

#### ***Descargas, corrientes, y circuitos/Charges, Currents, and Circuits***

*Descargas, corrientes, y circuitos/Charges, Currents, and Circuits* is an exhibit space where visitors can experiment with electricity and energy transfer. Using a variety of power sources, switches, and outputs visitors can work alone or in small groups to investigate the nature of electrical energy. Explora's transactive exhibits allow for individualized inquiry into several fundamental questions that serve as a basis for understanding and altering our relationship with electricity. How is electricity made? How is energy of motion changed into electrical energy? How does a switch work? What happens when electricity is transmitted over a distance? What does electricity need in order to flow and do the work we want it to do? Visit: [www.explora.us](http://www.explora.us).

### **National Museum of Nuclear Science and History, Albuquerque**

#### ***Energy Encounter***

Nuclear Power is an important option for the United States and the rest of the world to meet all our future energy needs. This exhibit looks at the world's dependence on all energy forms and how nuclear power will help fulfill those needs. Currently, nuclear power plants provide about 20% of the United States' electricity. In this exciting exhibit, visitors will learn of the history of nuclear reactor design, future reactor plans, and world energy issues that could be impacted by nuclear power generation. The exhibit features interactive exhibits that help the visitor understand the challenge of determining the right "mix" of traditional and alternative energy sources. Nuclear waste and its related issues are often hot items in our news. Radioactive waste occurs at all stages of the nuclear fuel cycle, whether it is from producing electricity or from nuclear medicine applications. Dealing safely with radioactive waste is critical to the environment as well as our own safety. Visitors will learn how waste is characterized, treated, handled, transported, and stored, as well as options for recycling and reprocessing. Discover the place nuclear power has in our energy-hungry world. Visit: <http://www.nuclearmuseum.org/exhibits/energy-encounter/>.

## New York

### **American Museum of Natural History, New York (organizer)**

#### ***Climate Change***

*Climate Change* addresses one of the most complex and urgent scientific and social issues of the 21st century: global climate change. Visitors of all ages will learn the science of climate change and discover the implications of unchecked climate change for future generations. Discover how individual, collective, communal, and governmental actions in using energy more efficiently, in combination with pursuing promising new energy alternatives, can make a meaningful impact in reducing global warming. Through interactive stations and videos as well as dioramas conveying the latest scientific concepts and research, *Climate Change* presents evidence that human activity over the past 300 years—including the burning of fossil fuels, deforestation, and other changes in land use—has dramatically altered the natural world. Greenhouse gases like carbon dioxide have increased rapidly in the atmosphere, changing the Earth's climate. *Climate Change* explains how the resulting global warming could severely stress human societies and damage ecosystems by causing sea levels to rise, increasing the incidence of drought and intense storms, drastically raising temperatures over areas of land and ocean surface, and bringing additional changes to the world around us. Discover solutions and learn what is needed to move away from dependence on fossil fuels toward a more energy-efficient economy. Future energy choices are vividly depicted, including solar power, wind power, nuclear power, and the use of carbon capture and storage (also known as carbon sequestration). Find out how you can contribute to a global solution through simple changes in individual behavior, such as taking mass transit instead of driving, using energy-efficient appliances, and paying all your bills online. Visit:

<http://www.amnh.org/exhibitions/climatechange/>.

### **New York Transit Museum, Brooklyn**

#### ***ElectriCity: Powering New York's Rails***

In October 2011, the New York Transit Museum opened its largest new exhibit in over a decade—*ElectriCity: Powering New York's Rails*. This major, long-term exhibit engages visitors in a compelling and participatory exploration of electricity's role in powering the metropolitan region's subways and commuter

rails. Part science, part history, *ElectriCity: Powering New York's Rails* occupies approximately 2,000 square feet on the mezzanine level of the Museum, and is a centerpiece of the visitor experience. The exhibit weaves together historic objects from the Museum's extensive collection with carefully crafted, science-based interactives that appeal to children and adults. Design services are provided by Liberty Science Center, one of the nation's leading science museums. *ElectriCity: Powering New York's Rails* incorporates authentic artifacts from the Museum's collections ranging from mammoth switches and circuit breakers to a giant subway control board panel (ca. 1932) that illustrates how the flow of electricity to the third rail was monitored and how the subway's power grid was managed. It features historical photographs that show construction and daily tasks involved in operating the subway, as well as architectural and engineering drawings that illustrate power-house and substation design, third rail track diagrams, and power to rail connections. Funded in part by a generous grant from Con Edison, *ElectriCity* also teaches the sustainable nature of public transit. Additional funding is provided by the New York City Department of Cultural Affairs and the New York State Council on the Arts. The exhibit is accompanied by extensive school and public programs. Visit: <http://www.mta.info/mta/museum/>.

### **Rochester Museum and Science Center, Rochester** ***ENERGIZE it***

What powers our bodies, cities, and planet, and is neither created nor destroyed? ENERGY. Developed and built by Rochester Museum and Science Center (RMSC) staff and volunteers, *ENERGIZE it* features various types of energy in a fully interactive setting. In a multi-sensory, highly physical experience—YOU hold the power. You're welcomed by an awesome "Jacob's Ladder," where bright plasma grows, climbing higher and higher until it reaches the top and vanishes! Another arc is immediately created at the bottom and the mesmerizing, fiery display repeats. Throughout the 3,500-square-foot exhibit, various energizing elements combine to create an all-encompassing experience that's felt, seen, and heard. The theme of *ENERGIZE it* is choices. Hydro, solar, geothermal, or "green," each choice matters—each person matters. Create a delightful chaos of sounds and visuals. Cycle, push, and pump to create power and discover the outcome—wind blows, water flows, and lights shine. Get instant information with QR (quick response) codes! Simply swipe your smartphone across a code, similar to a bar code, and receive data on your particular topic of interest. Information sheets are available as well—seeking to give options to everyone! What kind of energy do YOU use? Whether it is a seemingly small personal choice, or a big one, the outcomes of our choices affect us all. Choices are powerful. Visit:

<http://www.rmhc.org/MuseumAndScienceCenter/exhibits/energizeit/>.

### **Schenectady Museum & Suits-Bueche Planetarium, Schenectady** ***Fueling the Future***

*Fueling the Future* focuses on the use of alternative energy in transportation. It explores the different types of alternative fuels, how they work, and their advantages and disadvantages. The artifacts in the exhibit include a 1978 General Electric electric car, a prototype fuel from the 1950s, and a model of the fuel cell that flew in the Gemini space missions. Interactive components include talking gas pumps; a new fuel cell section adds greater interactivity and explores a partnership that was formed to test a residential fuel cell.

#### ***Wind and Solar***

The *Wind and Solar* exhibit explores how wind and solar power work and how they are currently used within New York State. Activities includes comparing solar cell output on a sunny and cloudy day, comparing different types of wind turbines, and activating actual residential wind turbines.

#### ***SuperPower***

The concepts for the *SuperPower* exhibit were inspired by SuperPower, Inc., a world leader in developing and producing superconducting wire, in honor of their 10th anniversary. It includes a touchable sample of the superconducting wire, an interactive component that compares cities with and without the new wire, and information about the research that SuperPower, Inc. has been conducting. Visit:

<http://www.schenectadymuseum.org/events/exhibits.php>.

### **The Wild Center, Tupper Lake** ***Green Facility and Planet Adirondack***

The Wild Center is a model of sustainable green building and living. Visit and you can see first-hand all the pieces that make it the first Silver LEED Certified museum in New York. Most of the features that make the Center a green facility are described along the *New Path*, a trail that winds around the main building and

over the campus. The exhibit includes outdoor labels that detail everything from the inner workings of the huge solar array on the BioBuilding to the pioneering new lighting and innovative new heating system that uses renewables to heat the entire 54,000-square-foot complex. Visitors can watch how much power the solar array is producing now here. The Wild Center's heating system uses an innovative combination of renewable energy solutions. It integrates a solar tube hot water system with a pellet furnace. The new boiler system is the first highly efficient, commercial-sized, gasification wood-pellet boiler of its kind and size manufactured and installed in New York State. In the summer of 2012, there will be the opening a major new exhibit, *Planet Adirondack*, featuring NOAA's *Science on a Sphere*. This exhibit will allow the Wild Center to better communicate the hard science behind climate change using beautifully illuminated displays of past, present, and real time global data. Visit: [www.wildcenter.org](http://www.wildcenter.org).

## North Carolina

### **Catawba Science Center, Hickory** ***Energy Avenue***

On *Energy Avenue*, visitors can create and launch rockets, race a friend on pulley playground, take a spin in Spin Circle, power a TV and electric fan, and more. Visit: <http://catawbascience.org/exhibits.html>.

### **North Carolina Museum of Natural Sciences, Raleigh** ***Nature Research Center and Renewable Energy Exhibits***

How far can a car that runs on electricity go and what are North Carolina middle and high school students doing to help design the future of electric automobiles? How can we make ethanol, a biofuel, from sources found in nature, like switch grass, sweet potatoes, and the loblolly pine? What challenges are encountered when breaking down plant cellulose to make biofuels? The answers to these questions and many others can be found in exhibits about renewable energy at the North Carolina Museum of Natural Sciences' new wing, the Nature Research Center. Get up close with cars of the future by seeing an electric car, a Chevy Volt, stripped down to its chassis, battery, and engine components. Find out this year's winners of the Sustainable Transportation Education Program. Use a Decision Table, created by Koshland Science Museum, to see how small changes made by just one person today can positively and negatively affect the environment in 100 years. Students can make biofuel from algae in the Genomics and Microbiology Investigate Lab and participate in *Earth: The Operator's Manual* programming. Also on display is a wind turbine at the Museum's 46-acre field station, Prairie Ridge. Visit: [www.naturalsciences.org](http://www.naturalsciences.org).

### **SciWorks, Winston-Salem** ***SciWorks Science Park***

SciWorks, the Science Center and Environmental Park of Forsyth County, offers experiences in the natural and physical sciences in its seven indoor science halls, its traveling exhibits hall, the 50-foot, 120-seat domed Planetarium, and outside in its environmental park habitats and the ever-popular barnyard. The *SciWorks Science Park* features exhibits on energy and sustainability, while the *Energy Port* features solar panels and a wind turbine and informs visitors about the energy being produced. In addition, other sustainability and environmental issues are demonstrated in the *Educational Rain Garden* and *Urban Gardening* exhibits and through composting. Visit: [www.sciworks.org](http://www.sciworks.org).

## Ohio

### **Cleveland Museum of Natural History, Cleveland** ***PNC SmartHome***

To showcase the promise of extreme energy-efficient performance and beautiful design, the Cleveland Museum of Natural History (CMNH) built a 2,800-square-foot, three-bedroom house as an exhibit on its grounds. The *SmartHome* is expected to use 90% less heating and cooling energy than a conventional house and is on track to be the first certified Passive House in Northeast Ohio. It features super-insulation, virtually air-tight construction, high-performance windows, energy-recovery ventilation, and orientation for passive solar heat gain. Guided tours of the fully furnished home were offered throughout the summer and early fall of 2011. Then the home was moved to a vacant lot nearby where it was finished and offered for sale. The SmartHome gave thousands of people hands-on experience with the most advanced, practical, and attractive techniques of green building and energy conservation, and it is inspiring other energy-efficient building projects in Northeast Ohio. It also is a tangible example of the museum's

commitment to the redevelopment and sustainability of Cleveland neighborhoods. Visit:  
<http://cmnh.org/site/AtTheMuseum/OnExhibit/SmartHome.aspx>.

### **COSI, Columbus** ***Innovations in Energy***

Meeting our current and future energy needs requires innovative people creating products, services and processes. Explore why energy is so important in this 1,500-square-foot exhibit. Compare four potential fuels for transportation. Experience careers related to energy. Learn about the Smart Grid and how it will change how you manage energy at home. Find out what home weatherization could do for your comfort, your budget, and the environment. See examples of energy efficient buildings in Columbus and environmentally friendly building materials. Follow stories of innovation from The Ohio State University, Battelle, Algaeventure, and more. Play the "Energy Hogs" game. Made possible with support from the American Electric Power Foundation, Dynalab, and PPG Industries. Visit:  
<http://www.cosi.org/exhibits/innovations-energy>.

### ***The POD House***

The POD house was built by students from The Ohio State University in the School of Engineering and the Knowlton School of Architecture. At 128 square feet, it is designed to be a sustainable home for one to two people. The POD exhibits a number of innovative green building technologies, such as solar electric power, solar hot water heating, graywater recycling, energy and water saving appliances, and a unique phase change material to provide passive solar heating. The walls and roof are Structurally Insulated Panels and the house is oriented to take best advantage of passive solar heating in the winter and day lighting year round. <http://www.cosi.org/exhibit/big-science-park>

### ***Energy Investigation Stations (Coming in 2013)***

*Energy Investigation Stations* (working title) is the second phase of the three-year *Innovations in Energy* project. The project will result in a 4,000 square foot exhibit opening in spring 2013 and related programs that explore human energy use for transportation, household needs, and product manufacturing. *Energy Investigation Stations* is about empowering people to make informed choices about their personal energy use. The exhibit components will be designed to allow content to be updated as new technologies emerge line and energy-related issues evolve.

### ***Energy Efficiency Project***

In an effort to "walk the walk" of sustainability as well as "talk the talk," COSI has made improvements to the building energy system that have reduced electric usage by 1 megawatt per year. An energy audit yielded some zero to low cost changes to operations, as well as some updates that required additional investment. Over the course of three years, COSI has worked with the local electric utility to find creative funding strategies that allowed them to upgrade their building systems and reduce their total energy use.

### **Great Lakes Science Center, Cleveland** ***Renewable Energy Exhibits***

Dedicated to being eco-friendly, Great Lakes Science Center installed a 150-foot tall wind turbine right on its front lawn to generate clean, renewable energy. Coupled with that is a 300-foot solar array canopy. Combined, they provide about 6-8% of the Science Center's power supply. The turbine was made possible through a collaboration with The Cleveland Foundation, the U.S. Department of Energy, Parker Hannifin Corporation, and the Lubrizol Corporation. The turbine contains Parker Hannifin components and Lubrizol products to help it operate effectively and efficiently. Both of these local companies, who are at the forefront of wind technology, use the wind turbine to monitor performance of their materials, to test those materials and to make changes when necessary to improve performance. The solar array is made possible through funding from Cleveland Foundation, Ferro Corporation, and the U.S. Department of Energy. Additional partners include Panzica Construction, Doty & Miller Architects, and GE Energy. Visit:  
<http://www.glsc.org/energy/renewable.php>.

### ***Future Exhibit***

The Great Lakes Science Center is also planning an exhibit that would demonstrate the full scope and complexity of how humans use energy to conduct their lives. Since electricity is the prime energy resource used in all human activities, the exhibit should trace the path of electrons from fuels to generation to transmission to end use. A basic understanding of direct current and alternating current leads to fuel types and turbines; demonstrating the complexity of moving and sharing electricity in the region through

transmission and distribution networks is a goal for the project. The exhibit will include renewable sources of energy including solar, wind, geothermal, tidal and wave, and biomass. The exhibit will demonstrate how individuals can contribute on a personal level using new technologies to reduce energy use.

### **McKinley Presidential Library and Museum, Canton** ***Wind Turbine and Future Exhibits***

The McKinley Presidential Library and Museum features a 106-foot wind turbine—the Skystream 2.4 comes with educational software. A kiosk on energy is currently being constructed, and future plans call for an "eco living area," and additional kiosks focused on solar energy. In addition, the museum will be receiving a solar race car made – and donated by – the Stark State College, which will be placed on permanent display. Visit: <http://www.mckinleymuseum.org/>.

### **The Works, Newark** ***Zap Lab***

The Works' *Zap Lab* has electricity and magnetism everywhere! Learn exactly how they work by exploring the forces behind these cool forces of nature. This lab is full of hands-on electrifying stations, including: *Magnetic Masterpiece*, where visitors can create a 3D robot out of magnets and learn how a magnet is the key to making a compass work; *Sizing Up Light Sources*, where visitors can discover how different kinds of incandescent, fluorescent, and LED lights use electricity; *Jacob's Jolt*, where a jolt of electricity can be dangerous and visitors learn how electrical currents are conducted through paths; *Circuits Are A Snap*, where creating circuits is a snap and visitors use guide books to build their own simple circuits that really work; *Human Power Station*, where visitors can turn the wheel to see how much energy it takes to run the everyday appliances in their houses; *Magnetic Makeover*, where visitors use a magnet pen to grab and move iron filings to add hair to a funny face; and *Pushing Pulling Polar Forces*, where visitors learn about the forces of magnets and how they attract and repel each other in a cool, hands-on experiment. Visit: <http://www.attheworks.org/ExploreTheWorks/ActivityLabs/ZapLab.aspx>.

## **Oregon**

### **Oregon Museum of Science and Industry, Portland** ***Renewable Energy: Exhibit & Classroom Outreach Programs***

This exciting new permanent exhibit will invite Oregon Museum of Science and Industry (OMSI) visitors to learn about renewable sources of energy, and consider the tradeoffs involved in using any energy source. In partnership with Portland General Electric, SolarWorld, Vestas, the Bonneville Power Administration, Meyer Memorial Trust, M.J. Murdock Charitable Trust, and The Collins Foundation, the hands-on exhibit will focus on the unique energy mix of the Pacific Northwest, including emerging technologies in solar, wind, and wave energy. An immersive energy center will show visitors how energy providers cope with changing demand, and how energy choices impact their lives in economic, environmental, and social ways. The exhibit opens in December 2012. Related classroom outreach programs encourage students to investigate energy sources and technology, explore sustainable choices, and learn about global climate change. The programs feature portable exhibits that allow students to design and test their own wind turbine, explore how families can reduce their energy consumption, and learn what ice cores can tell us about the history of the earth's atmosphere. Visit: <http://www.oms.edu/on-view/in-earth-hall>.

### ***Earth Lab: Exhibit & Classroom Programs***

OMSI's new *Earth Lab* provides a series of fun, hands-on exhibits and demonstrations designed to teach visitors about core earth science concepts. Topics include density, ice cores and climate science, plate tectonics, and renewable energy. Each of these engaging new experiences is bilingual (English and Spanish) and designed to enable families to participate in science together. OMSI educators have also created companion class programs to extend the learning to school groups visiting the museum. Visit: <http://www.oms.edu/on-view/in-science-labs>.

### ***Solar Charging Station***

The first institution in North America to install a solar canopy charging station, OMSI partnered with the SANYO North America Corporation (SANYO), InSpec Group (InSpec), and Portland General Electric to provide a solution for the increasing use of alternative transportation. The canopy is available for public use and can service cars, e-bikes, and most portable personal electronic devices.

# Pennsylvania

## **Carnegie Science Center, Pittsburgh** ***Energy Challenge***

This new exhibit is all about energy. While you're exploring the Science Center, grab a few friends or family members and step up to this interactive kiosk game show that pits teams against each other as they challenge each other for the title of Energy Champion. This exhibit is sponsored by the U.S. Department of Energy's National Energy Technology Laboratory (NETL). Visit: <http://www.carnegiesciencecenter.org/exhibits/energy-challenge/>.

## **Franklin Institute, Philadelphia** ***Electricity***

Feel the force of electricity by manipulating electrical phenomena, exploring authentic artifacts, and tackling questions of sustainable electricity generation and use. This exhibition is energized, with interactive devices and graphics glowing from within the darkened gallery, illustrated by simple, edgy imagery. At its foundation, electricity is derived from the interaction of charges. Experience these interactions yourself by becoming a conductor for static charge. See the electrical impulses inside your own muscles. Use your body to complete a circuit. These same fundamental properties of electrical charge also allow us to generate power. Explore the fuel sources needed to generate our electricity. Decide which personal and community choices really can make a difference in how electricity continues to alter our lives. *Electricity* will spark your curiosity about the power of this phenomenon and what it holds for our future. The featured centerpiece of *Electricity* is a Sustainable Dance Floor, which generates power to illuminate itself as people move on the tiles. Visitors will witness a spectacular electrical discharge from a giant Tesla coil overhead. To delve into Benjamin Franklin's pioneering studies, visitors browse through an electronic copy of his book *Experiments and Observations on Electricity*. As visitors stop at key passages, relevant historical and modern artifacts from The Franklin Institute's collection are illuminated along a wall display. *Build a Circuit*, an open-ended activity bench, invites visitors to arrange combinations of electronic components together in order to successfully create a working circuit. This engaging activity builds on multiple levels of knowledge and provides an opportunity for families to learn together. An art installation, *Electrical Signals*, is an array of light-emitting diodes (LEDs) that respond to electrical signals imperceptible to the human eye. As visitors make a call or send a text message from their own cell phones, the transmitted signals cause the LEDs to light up. *Compromising Choices* demonstrates how sustainable electricity generation requires global decision-making. In this social game, each visitor leads a nation through technological and economic growth, choosing diverse energy sources to meet its needs for energy consumption while balancing environmental damage and resource depletion. Visit: <http://www2.fi.edu/exhibits/permanent/electricity.php>.

## ***Hidden Power: Energy, Electricity, and Efficiency***

This program developed by The Franklin Institute, in partnership with Penn State MRSEC, through funding by the National Science Foundation and Penn State University, is a set of eight cart-based, hands-on activities that highlight concepts of energy, electricity generation, and efficiency. Demonstrations of real phenomena will appeal to visitors of all ages, while interactive macro-scale models foster a deeper understanding of the underlying mechanisms at the atomic scale. These activities raise awareness of energy materials and their applications, and build understanding of the invisible forces at work. Visit: <http://www.mrsec.psu.edu/museum/fourth/>.

## **Whitaker Center for Science and the Arts, Harrisburg** ***Move It! Gallery***

Whitaker Center's Harsco Science Center offers many exhibits on topics related to energy. *Spin It*, in the *Move It!* Gallery, invites guests to build and test their own wind turbine by choosing the number, shape, and pitch of a variety of miniature turbine blades, installing the blades into a hub, and then turning on the "wind" to see how fast their design spins in comparison to the fastest speed achieved by other visitors that day. *Race It!* allows guests to explore friction, aerodynamic styling, and the conversion of potential energy into kinetic energy as they build and race model cars on a sloping track equipped with electronic timers, comparing their model's speed with the best speeds achieved that day by other guests. *Power It!* displays and explains an award-winning solar-powered car designed and built by a team of local college students for a race from Chicago to Los Angeles. Visit: <http://www.whitakercenter.org/move-it>.

### **Backstage Electricity and Science on a Sphere**

*Backstage Electricity* in the new *Backstage Studio* gallery allows visitors to learn the basics of electricity as they build simple circuits to turn on light bulbs, ring bells, and spin motors. *Science On a Sphere* in the *Forces of Nature* gallery allows visitors to select from a menu of informative and entertaining programs created specifically for the spherical screen, including *Energy Planet*, an overview of the energy challenges facing our planet and how renewable energy technologies can help meet them developed by the U.S. Department of Energy's National Renewable Energy Laboratory. Visit:

[http://www.whitakercenter.org/backstage\\_studio](http://www.whitakercenter.org/backstage_studio) and  
<http://www.whitakercenter.org/forces-of-nature>.

## Tennessee

### **Creative Discovery Museum, Chattanooga**

#### **Road Trip Challenge and Future Exhibits**

Creative Discovery Museum (CDM) has a software-based game kiosk that has a focus on energy conservation. There, children take a virtual trip using good energy choices and answering questions regarding types of energy and their uses. The game, *Road Trip Challenge*, involves problem solving and is being funded by a grant from the Department of Energy and the BioEnergy Science Center (BESC). This kiosk, which premiered in February 2012, is the beginning of several energy-related exhibits on renewable energy sources that CDM plans to develop over the next few years. Visit: <http://www.cdmfun.org/>.

## Virginia

### **Science Museum of Virginia, Richmond**

#### **Watt Wall**

*Watt Wall* is a dynamic, 100-square-foot computer screen display of rapidly updated data and images showing energy demand, sources, consumption, and population growth. The information is presented on global, national, state, residential, and personal scales to engage the student, to stimulate discussion, and to prepare the way for hands-on investigations and thought-provoking lessons.

#### **New Energy Virginia**

The Bergey XL-1 wind turbine unit produces up to 1 kW of power. The photovoltaic roof array by Atlantis Sunslates®, in an 800W residential grid-connected system, have the look of a slate roof. The geothermal system has a 600-foot trenched loop, with a 1.5-ton reversible heat pump. The solar domestic hot water system produces hot water from pipes under the solar cells on the roof, while cooling the photovoltaic array, making it more efficient. Solar heat panels capture the sun's heat efficiently bringing the temperature up to 140°F in full sunlight. Interactive Exhibits: The *Bicycle Generator* allows visitors to "race" the wind turbine. The *Swivel Panel Solar Photovoltaics* show the effect of the sun's angle on power output. The *Swivel Mirrors and Parabolic Dish* focus the sunlight, heating to 1000°F. The award-winning *Virginia Tech Solar Decathlon House* has an 8.4 kW grid-connected photovoltaic roof panel system, two 3-ton geothermal heat pumps, and a 500-foot-deep geothermal well. The passive solar system uses the south clerestory windows to admit winter light to warm the north interior wall, but blocks the high-angle summer sun. Visit: <http://www.smv.org/exhibits.html>.

### **Virginia Living Museum, Newport News**

#### **Living Green**

The Virginia Living Museum has a special, permanent exhibit about energy conservation—the first green building in Virginia that was designed as a "see through" exhibit structure to educate people about energy conservation. This *Living Green* exhibit house opened as a permanent exhibit in 2009, and contains over 30 green building products/designs including: three types of energy efficient wall systems; ground source (geothermal) HVAC system; living green roof; rain water collection system; solar PV electric panels; evacuated tube solar water heater; radiant floor heating; recycled paper siding; alternative lumber choices for treated wood; daylighting, solar light tubes and LED lighting; six kinds of alternative insulation materials; green interior finishing options; interactive displays; passive solar design; and conservation landscaping. Already visited by thousands of Virginia students and toured by groups of architects, urban planners, and solar enthusiasts, this unique exhibit is helping bridge the gap between industry experts and the public. Visit: <http://www.thevlm.org/living-green.aspx>.

## Partnerships

**Science Museum of Minnesota (St. Paul, MN), North Carolina Museum of Natural Sciences (Raleigh, NC), Ruben H. Fleet Science Center (San Diego, CA), Fort Worth Museum of Science and History (Fort Worth, TX), and Oregon Museum of Science and Industry (Portland, OR)**  
***Earth: The Operators' Manual***

Partnering with the five major science institutions listed above, *Earth: The Operators' Manual (ETOM)* is an optimistic and apolitical multiplatform initiative presenting clean, renewable energy as a feasible and affordable solution to climate change caused by the emissions of CO<sub>2</sub> by humans, meaning... all of us. Funded by the National Science Foundation, ETOM features three hour-long broadcasts on PBS, and also includes on-site public presentations by award-winning geoscientist Richard Alley (whom the *New York Times* called "a mix of Woody Allen and Carl Sagan"), as well as Marines and retired Army officers presenting how the Pentagon is cutting back on the use of fossil fuels to enhance mission security. Each science center partner developed events customized for their region and particular audiences: SMM made Alley's informative but also occasionally humorous "Adventures of a Climate Scientist in the Age of Politics and Punditry," part of a regular lecture series, which was taped for later broadcast via public television stations and the web, and also arranged visits to local universities. OMSI featured Alley in a lively and well-attended *Science Pub*. NCMNS arranged Science Cafes with a venture capitalist pursuing "clean coal" and Andy Revkin, the *DotEarth* blogger. In Fort Worth, ETOM served as the catalyst for a city-wide "Sustainability Roundtable," bringing together stakeholders from government, industry, and the private sector to brainstorm new approaches to planning, transportation, and energy. Fleet built Alley's presentation into the 2011 *San Diego Science Festival*, and held a "Military Goes Green" event with retired U.S. Army Colonel Dan Nolan and local Navy officers on board the USS Midway. In April 2012, the unique ETOM vision of positive solutions to climate change through clean energy was part of the opening of NCMNS' new Nature Research Center. PBS broadcasted all three ETOM specials as a major component of its Earth Day programming on April 22: The programs are "Earth: The Operators' Manual," "Powering the Planet" and "Energy Quest USA." Science center partners plan preview screenings with follow up panels featuring local presenters. ETOM's online resources (to be supported through 2015) include an Energy Gauge with widgets, allowing users to compare their bills with others, see how much buying a hybrid car might save them in dollars (and also cut CO<sub>2</sub> emissions), and discover clean energy rebates for their zip code. All of this is part of an "Energizing America" social media campaign that will be sustained beyond the broadcasts and even after the museum events are completed.

Visit: <http://earththeoperatorsmanual.com> and <http://wattzon.com>.

## CANADA

### Alberta

#### **TELUS Spark, Calgary** ***Energy and Innovation***

Alberta is the heart of the oil and gas sector in Canada, with the highest concentration of engineers in any city in Canada, Calgary—the home of TELUS Spark. As such, a focus on energy-related exhibits and programs is a given. However, instead of focusing on the mechanics and processes of oil and gas extraction, processing, and transportation, the museum's *Energy and Innovation* exhibition focuses on the transformation of energy. Throughout history we have devised ways to extract and transform energy to create our modern technological world. Conservation of energy is a fundamental law of the physical universe—energy is neither created nor destroyed. Energy can only be transformed—released from one form and harnessed to another, with much of the energy being lost to other forms along the way. Understanding this fundamental concept changes visitors' relationship with energy—no longer will they see "energy sources" in isolation, but rather they begin to see the connections between different forms of energy and the roles that energy plays in their daily lives. Simultaneously, visitors are honing skills and capabilities needed for innovation, including problem solving, collaboration, experimentation, and curiosity. These skills are vitally important to ensure we can continue to tackle worldly challenges—including some that we may not even be aware of just yet. Visit:

<http://sparkscience.ca/explore/energy-innovation/>.

## Ontario

### **Canada Science and Technology Museums Corporation, Ottawa**

#### ***Let's Talk Energy***

The Canada Science and Technology Museums Corporation (CSTMC) has developed an innovative and comprehensive pan-Canadian energy literacy initiative called *Let's Talk Energy*. Working with an advisory committee composed of members from industry, government, academia and NGOs, it builds on three major exhibitions on energy recently launched at the three CSTMC museums in Ottawa. The initiative is also supported by a national network of 24 partner institutions with energy-related exhibitions and programming at 27 locations. The initiative has mobilized the entire organization and includes diverse elements including exhibitions, educational materials, programming and events, and online components, for example: *Edukits* – travelling suitcases that include bilingual information, activity plans, and materials to carry out hands-on lessons on energy subjects at both the elementary and high school levels; *Information Kiosks* – designed to provide an overview of Canada's energy sector in an engaging and interactive way, these are placed across the country in strategic public locations such as science centers, museums, academic institutions and airports; *Virtual Programs* – free downloadable sets of lesson plans for high school teachers focused on contemporary issues surrounding transportation and energy; and *Watt's Up* – a travelling exhibition that focuses on energy and electricity created in partnership with the Saskatchewan Science Centre (Regina, SK) THEMUSEUM in (Waterloo, ON), and the Sherbrooke Musée de la nature et des sciences (Sherbrooke, QC). Visit: <http://energy.technomuses.ca/english/>.

### **Canada Science and Technology Museums Corporation/Canada Agricultural Museum, Ottawa**

#### ***Energy Park: Nature at Work***

See renewable energy in action at the Canada Agriculture Museum's *Energy Park: Nature at Work*. The outdoor exhibition—the museum's first—explores energy use on Canadian farms, and takes a look at how the technology for harvesting energy from renewable sources is changing both the consumption and production of energy on the farm. This immersive garden experience gives visitors the chance to: (1) walk amongst a variety of biofuel plant beds to learn about biomass and biofuel crops; (2) use interactive components to learn about solar and wind energy; and (3) have the opportunity to read about some of the latest renewable energy research happening on farms across Canada. The biofuel plants will be changed from one year to the next to showcase some of the newest and most promising options, and the museum's five-year exhibition plan includes new demonstrations and interpretation to occur annually. Visitors to the museum's website can see how much electricity new solar panels on *Energy Park's* barn are producing today and how much the museum has saved in carbon emissions. Visit: [http://agriculture.technomuses.ca/english/exhibitions/energy\\_park.cfm](http://agriculture.technomuses.ca/english/exhibitions/energy_park.cfm).

### **Canada Science and Technology Museums Corporation/Canada Aviation and Space Museum, Ottawa**

#### ***Green Skies Ahead***

Since the first men and women attempted to leave the surly bonds of earth, aviation – whether in heavier or lighter than air machines – has been all about energy management. The Canada Aviation and Space Museum is proud to present *Green Skies Ahead*, an exploration of the innovative, carbon-friendly technology that will shape commercial aviation over the next 50 years. Join the museum as they investigate high-efficiency jet engines; new super-light, super-strong, composite materials; innovative wing designs; and cutting-edge navigation technology. The exhibition presents audio, video, and touch screens to provide interactive experiences for visitors. Highlights include an aircraft design lab where visitors can try to create fuel-efficient aircraft or take an up-close look at a giant turbofan engine. See futuristic energy-efficient aircraft designs on the drawing table today and decide if they are science or science-fiction. Visit:

[http://www.aviation.technomuses.ca/visit\\_us/at\\_the\\_museum/events/green\\_skies\\_ahead/](http://www.aviation.technomuses.ca/visit_us/at_the_museum/events/green_skies_ahead/).

### **Canada Science and Technology Museums Corporation/Canada Science and Technology Museum, Ottawa**

#### ***Energy: Power to Choose***

At 7,500 square feet – the largest exhibition of its kind in the country – *Energy: Power to Choose* explores the opportunities and challenges inherent in harnessing energy from all primary sources available in Canada. The exhibition encourages visitors to reflect upon their own consumption of energy, as well as the social, economic, and environmental consequences of current energy production practices in Canada.

The exhibition explores various themes, including energy use from the 1880s to the present day, including energy production, distribution, storage conservation, and efficiency. The exhibition is rich in the presentation of new technologies and includes numerous hands-on interactive opportunities both high- and low-tech. One section is devoted to examining the somewhat more light-hearted aspects of energy – visitors can try out a human-size hamster wheel to produce electricity, observe a live display of electric eels, or use a thermal-imaging camera. Visit:

<http://www.sciencetech.technomuses.ca/english/whatson/2011-exhibition-energy-power-to-choose.cfm>.

## GREECE

### **NOESIS – Thessaloniki Science Center and Technology Museum, Thessaloniki** ***Renewable Energy Program***

NOESIS' interactive program includes two versions—one for primary school students and the other for high school students (11-14 years old); specific links to the curriculum are contained in both. The program deals with renewable energy sources, and aims to: (1) help students learn about energy and natural resources; (2) realize the necessity for society to turn to renewable energy sources; and (3) reinforce their interest in energy-related problems. In the primary school version, students are engaged in playful activities, while in the high school version, students are asked to debate the pros and cons of specific sorts of renewable energy sources. An extensive teacher's guide for both versions is available on the NOESIS website. Visit: <http://www.noesis.edu.gr/>.

#### ***Interactive "Hamster Wheel"***

This exhibit consists of a large metal wheel (about 2.5 m in diameter) connected to a generator. Museum guests are asked to walk inside the wheel, thus setting it in motion. The movement inside the wheel transmits kinetic energy to the generator, which converts it to electric energy and, in turn, activates a luminous display. The faster someone walks inside the wheel, more electric power is produced and the display grows brighter. The voltage and the resulting electric current are displayed on counters attached to the handle of the exhibit. The exhibit gives guests an empirical understanding of energy transformations and of the fact that energy "production" comes with a cost (the more energy you want to "produce", the more difficult the turning of the wheel becomes). Hopefully, this makes them more conscious about how they consume energy in their everyday lives.

## INDONESIA

### **Pusat Peragaan Iptek, Jakarta** ***Energy Cluster and Electricity Cluster***

Pusat Peragaan Iptek (PP-IPTEK) has an *Energy Cluster* exhibit gallery consisting of 7 interactive components and 2 model nuclear reactors. The components include: (1) *Energy vs. Power*, where visitors can rotate a generator to produce electricity and save it in the capacitors, which are connected to a bulb. If visitors turn the button on, the bulb will be on. The brightness of the bulb depends on the energy produced by the visitor; (2) *Solar Cell*, which simulates how sunlight is converted to electricity using a solar cell; a lamp is used as an indicator. Here, visitors understand how solar cells can produce electricity and learn about alternative green energy; (3) *Solar Cell*, with a working water pump as an indicator; (4) *Convection Current*, which consists of a container with water, a heater rod inside, and a screen and lamp. If the button turns on, the heater works to heat the water. The current of water is projected to the screen by the light of lamp. The pattern of water convection current can be observed in the screen; (5) *Hot Hand* and (6) *Hot and Cold*, where visitors learn about heat transfer; (7) *UV Uranium Detector*, where visitors can observe a rock that contains uranium. The two model nuclear reactors showcase a future alternative green energy. An *Electricity Cluster* provides several energy-related exhibits, including a simple generator, a pedal generator, and a display on lightning. Visit: <http://ppiptek.ristek.go.id>.

## ISRAEL

### **Bloomfield Science Museum, Jerusalem**

#### ***SUN POWER – Innovative Development in Using Solar Energy***

Dynamic endeavors spurred by constant innovation are among the characteristics of research and development in the solar energy field. Israel, being a desert country with no fossil reserves, uses these very constraints as the groundwork for innovativeness and creativity, presenting a huge number of hi-tech companies and startups focusing on solar energy technologies. Solar energy technological breakthroughs have accompanied Israel's development as a modern nation, from the innovative solutions of solar ponds designed in the 1960s, to state-of-the-art solar collectors based on nanotechnology. Based on the museum's experience in presenting innovative development in its *Innovation* exhibition—and following a forum-theater they developed on green energy—the museum intends to create a future exhibition on solar energy. The *Sun Power* exhibition will present a selection of "born-in-Israel" inventions on solar energy, examine conditions that encourage technological innovation, and give visitors a chance to take part in the innovation process. A huge mirror lens by ZenithSolar, Pythagoras Solar's "solar window" and "solar-edge" PV monitoring system, and a HelioFocus tracking system are among the developments presented in the exhibition, promoting the public's exposure to solar energy solutions. Visit: <http://www.mada.org.il/>.

## JAPAN

### **Miraikan, National Museum of Emerging Science and Innovation, Tokyo**

#### ***Lifestyle 2050***

This interactive exhibition encourages visitors to think what their lifestyle will be like in the year 2050. As humans, we must balance "Limited Resources on the Earth" with our "Infinite Wishes and Desires"; otherwise, the earth might be inhabitable for all living beings. As visitors virtually walk around this future city, they discover a variety of science and technologies, such as renewable energy, a smart grid, and a superconducting cable. Visit: <http://life2050.jp/en/introduction/>.

#### ***Ecology Exhibit***

This exhibit illustrates that human lives have depended on a stable climate and well-balanced circulation of all the natural resources, including water and air. However, this natural circulation has been disturbed due to continuous excavation of natural resources. How can science and technology help regain the sustainable balance? Visitors will be challenged to find different types of environmentally friendly, renewable energies, and will learn about research on nuclear fusion power generation through the hands-on exhibit. Environmental issues cannot be solved only by science and technology; at the end of the exhibit, visitors are asked questions regarding environmental concerns, and can also share their thoughts on their experience by writing a message. Visit: <http://www.miraikan.jst.go.jp/en/>.

#### ***6.8 Billions' Survival***

This traveling exhibit illustrates how to maintain a fulfilling lifestyle while facing various created problems, such as the depletion of resources, an energy crisis, and global warming. Now, with the world's population at over 7 billion and growing, can future generations survive? The exhibition presents an experience-based "survival training program" exploring the frontiers of science as a human survival tool, and considers the four themes of energy, food, living environment, and tools. Plus, topics such as nuclear fusion, genetically-modified food, industrial plant/factory/agriculture innovations, nanotechnology, and space science will be included along with the latest data, images, and actual items. Visitors can view their future environment today through the eyes of cutting-edge science, examine science's influence, and gain a new perspective on the inherent problems and potential solutions they will face in "modern life." Visit: <http://www.miraikan.jst.go.jp/en/linkage/renting/survival.html>.

## PHILIPPINES

### **Philippine Science Spectrum, Marikina City**

#### ***Science Sparks!***

The Philippine Science Centrum is currently developing and fabricating its fifth set of the traveling exhibitions known as *Science Sparks!* with ENERGY as the overarching theme. The science concepts aligned with the Department of Education's learning competencies in energy for grades 3-10 underlie the

development of the exhibits. *Science Sparks!* is expected to be completed July 2012, and the exhibit's objective is to increase visitors' awareness of the nature of energy, its forms, sources, transformation, generation, impact on earth, and conservation. The exhibits are designed to prompt visitors to discover and understand underlying science concepts and aim to spark curiosity in young minds to imagine, think of, and even invent technologies relevant to their community. The set consists of 35 interactive exhibits organized in three galleries corresponding to the sub-themes of: (1) Energy Forms, Resources, and Generation; (2) Electricity and Magnetism; and (3) Energy Conservation. A panel presents visitors with an overview of the various exhibits that make up each of these galleries. As arranged, the colorful and highly manipulative displays are expected to foster an enjoyable, educational experience for visitors. Hopefully they will come away having learned many things about energy and science in general. Visit: <http://www.science-centrum.ph/>.

## SAUDI ARABIA

### **Mishkat Interactive Center for Atomic & Renewable Energy, Riyadh**

#### ***Exhibitions, Events, and Workshops***

Under the auspices of King Abdulla City for Atomic and Renewable Energy (K.A. CARE), Mishkat will bring together engaging and interactive exhibitions, events, and workshops aimed at the youth of Saudi Arabia. It will bring to life past and future innovations in the way we generate and use atomic and renewable energies, celebrating Saudi and worldwide achievements and supporting Saudi Arabia's ongoing central role in the energy economy by inspiring the Saudi youth of today to be the energy innovators of tomorrow. Mishkat is located in the heart of Riyadh and aims to provide a safe place for kids, parents, and teachers to engage and dialogue to acquire knowledge in the fields of alternative energy. Mishkat includes the *Energy Explorers Gallery*, the *Power Our Future Gallery*, *Energy Square*, an immersive theater, a briefing room, an interactive dialogue area, and educational halls for workshops, shows, and programs. Visit: <http://www.mishkat.edu.sa/>.

#### ***"Kingdom of Sustainable Energy" Film***

Mishkat has also developed an 18-minute immersive screen film entitled *Kingdom of Sustainable Energy*. The film explains Saudi Arabia's ongoing efforts to remain a responsible leader to supply the world with energy and, ultimately, becoming the "Kingdom of Sustainable Energy" while shedding light on various alternative energy technologies (namely solar, atomic, wind, tidal, and geothermal). All of Mishkat's exhibits—and this film—are developed in both the Arabic and English languages, which ensures an even wider reach for the museum's diversified audience.

## SERBIA

### **Center for the Promotion of Science, Belgrade**

#### ***Science Workshop on Renewable Energy***

The Republic of Serbia's Center for the Promotion of Science offered young people the chance to attend a *Science Workshop on Renewable Energy*. During the workshop, kids had a chance to familiarize themselves with sustainable development and green energy (science and architecture in the service of sustainability). Workshop participants designed—and then actually created—a model of a windmill, which produced energy for a cardboard house. Subsequently, a small urban "community" was composed using the windmill models, creating a "Workshop Wind Park." Visit: <http://www.cpn.rs/>.

## SWEDEN

### **Teknikens Hus, Luleå**

#### ***Grasping Climate***

*Grasping Climate* is a travelling exhibition about climate change and what we can do to prevent it. The average temperature on Earth is rising—what is going on with the climate? How does this affect me? These questions were the starting point when Teknikens Hus created its exhibition. In *Grasping Climate*, visitors learn background information about the increased greenhouse effect and learn that in 100 years time, the average temperature on the Earth might rise as much as 6 degrees C; the result can be both drought and floods, in addition to extreme heat and cold. But there is hope! The exhibition shows actions we all can take in our everyday lives to reduce climate change, and visitors can also explore renewable

energy sources. The exhibition has been travelling in Sweden, Nordic countries, Europe, and the Middle East, and a related guidebook for teachers is available for free download in English and Swedish. Visit: <http://www.teknikenshus.se/english/travelling-exhibitions/grasping-climate/>.

## UNITED KINGDOM

### England

#### **National Museum of Science & Industry, London**

##### ***Energy Hall***

For over 300 years, steam has been the driving force behind British trade and industry. Even now, steam turbines generate the majority of the electricity we use every day, both at home and at work. The *Energy Hall* showcases an unparalleled collection of historic full-size engines and models. Displays range from the oldest surviving and unaltered atmospheric engine to rotative engines built by James Watt, high-pressure engines of the type pioneered by Richard Trevithick, and a steam turbine designed and built by Charles Parsons. The gallery uses working models and full-size engines, animations, interactive touch screens, and much more to tell the story of steam power, its inventors and users, and the extraordinary part they played in shaping the modern world. Visit:

[http://www.sciencemuseum.org.uk/visitmuseum/galleries/energy\\_hall.aspx](http://www.sciencemuseum.org.uk/visitmuseum/galleries/energy_hall.aspx).

##### ***Energy: Fuelling the Future***

Perfect for children aged 7–14 and their teachers or families, *Energy: Fuelling the Future* looks at our present and future energy needs and uses. The gallery is packed with thought provoking games and exhibits developed with leading digital artists; visitors can try out touch-sensitive screens, giant spinning drums, and dance-floor footpads to question and discover how we will meet the planet's growing energy demands. Where does energy come from? What does electricity actually *feel* like? Do we have all the energy supplies we need? And what on Earth is a fossil fuel? Visitors can even join the debate by leaving their thoughts for others to see on the *Energy Ring*, a huge interactive sculpture suspended in the air.

Visit:

[http://www.sciencemuseum.org.uk/visitmuseum/galleries/energy\\_fuelling\\_the\\_future.aspx](http://www.sciencemuseum.org.uk/visitmuseum/galleries/energy_fuelling_the_future.aspx).

##### ***atmosphere Gallery***

The *atmosphere* gallery is a fresh and exciting way to make sense of the climate—the science of how it works, what it's doing now, what it might do next—and how we can adapt to a low-carbon lifestyle and new energy sources. In *atmosphere* visitors step into a different world, with its own land, oceans, ice, and, above visitors' heads, its delicate atmosphere. Guests can follow the five fast games and see actions played out before their eyes in this immersive and interactive gallery. They can also explore our climate-changing world as they travel through the landscape, go back in time to find key climatic moments in the Earth's multibillion-year history, uncover the secrets of ice cores and stalagmites, and then head for the future to wonder at the latest ideas for a low-carbon life. More than a hands-on gallery, *atmosphere* reveals some of the key instruments used by today's scientists, reports on some of the latest climate news, and gives visitors the chance to dig deeper into the story of our changing climate. Visit:

<http://www.sciencemuseum.org.uk/ClimateChanging/AtmosphereGallery.aspx>.

##### ***Ten Climate Stories***

Forming part of the Science Museum's three-year climate change programme, *Ten Climate Stories* is a series of gallery interventions about energy and climate change. From an imperfect toaster to a parade of pylons, some interventions tell hidden stories about some of the Museum's best-loved exhibits whilst others showcase work from both emerging and established artists. *Ten Climate Stories* takes a long view of our climate changing world—where all is not what it seems. A new suite of 10 stories will be added to the existing ones in July 2012, providing more opportunities to explore the Museum with a climate changing lens. Visit:

[http://www.sciencemuseum.org.uk/visitmuseum/galleries/ten\\_climate\\_stories.aspx](http://www.sciencemuseum.org.uk/visitmuseum/galleries/ten_climate_stories.aspx).