



# PLASTICS·PIPE·INSTITUTE®

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BUILDING COMMUNITY



## SOLAR FARM UNDERGROUND WIRING TO LAST AS LONG AS THE SUN WITH HDPE CONDUIT

SOUTH BURLINGTON, VT - The largest solar farm of its kind in North America elected to locate power and control cables in underground conduit made from high-density polyethylene (HDPE) as a way to increase the life of the facility. Coming online in July 2011, the 2.2 MW solar farm covers 25 acres and includes 382 solar trackers. Cables convey power from the solar trackers to the electric grid. AllEarth Renewables, Inc. (Williston, VT), designed the solar farm and manufactured the AllSun Trackers™ Series 24 solar trackers.

"From a sustainability standpoint, HDPE pipe and solar power are a unique partnership," stated Tony Radoszewski, executive director of the Plastics Pipe Institute, Inc. (PPI), the major trade association representing all segments of the plastic pipe industry.

"Like solar, a plastic pipe system is a sustainable and environmentally responsible choice that will serve generations to come. The HDPE conduit is ecologically efficient during manufacturing. The conduit is also strong, durable, light-weight and flexible while providing excellent protection for the power and fiber cables inside, and requires significantly less energy to fabricate, transport and install than other pipe products. And here in Vermont, HDPE conduit is the perfect choice to stand up to the extreme cold weather and frozen earth, plus it was the key to a successful trenchless run in one section."

Installation of the HDPE conduit was done using cut and cover, and horizontal directional drilling (HDD) under a forested area. All low voltage wiring used UL 1990 certified Cable In Conduit (CIC) provided by Blue Diamond Industries, LLC (Lexington, KY). Blue Diamond is a member company of the PPI.

The AllSunTracker conduit included nearly 70,000 feet of 3/4 inch CIC pipe with three 6AWG cables - black, green and white - and 5,000 feet of 2.5-inch diameter CIC with 4/0 wiring for the panel feeder lines. Blue Diamond supplied Cable In Conduit on reels ranging from 2,000 to 10,000 feet. The company is listed by UL for specification UL 1990, Nonmetallic Underground Conduit with Conductors and its CIC is manufactured under ASTM D 3485.



AllSun Tracker units are mounted on poles and use an internal GPS system to move with the sun as it crosses the sky, keeping the solar panel at a perpendicular angle to the sun's rays. The use of HDPE Cable In Conduit sped installation and reduced costs while increasing the lifetime of the 25-acre, 382-unit system. Vermont Governor Peter Shumlin spoke at the commissioning of the solar farm.

"Most solar farms use underground PVC pipe," stated Doug MacDonald, engineering technician for AllEarth. "Wire is pulled onsite after conduit installation. HDPE conduit saves in multiple ways that includes less labor to install. For this project, the HDPE conduit came preloaded with the wire, so it was really just a one step process after digging the trench. It also enabled us to use a smaller conduit size, reducing the cost of materials. In addition, less handling meant more savings."

"Typically when other types of conduit are used, and this can be electrical metallic tubing - EMT- or PVC, it can turn into a very labor-intensive project,"



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explained Radoszewski. "This is because a trench must be dug, the conduit installed and then a pull rope is blown through the conduit so that each wire can be pulled back through. Because the HDPE conduit can have the wire installed when the pipe is being extruded, it comes to the job site ready to go. This saves considerable time.

"Custom lengths can be ordered and sometimes a single reel will hold thousands of feet, which puts more conduit at the site to further expedite installation," he continued.

"Installing the cable in the conduit at the factory ensures that a clean and damage-free cable is delivered to the field. CIC also eliminates the added expense of pulling the cable onsite under muddy and dusty field conditions which aren't the best for a good clean installation."

The AllSun Trackers are pole-mounted, dual axis trackers that follow the sun throughout the day guided with a GPS system. Each of the 382 units move from east to west and up and down, tracking the sun in order to maximize efficiency as it transforms solar energy into electrical energy. Total power produced by the South Burlington Solar Farm is estimated to be approximately 3,000,000 kilowatt hours a year -- 45 percent more than the amount of electricity that could be produced by a fixed roof-top photovoltaic system of the same size. The project is owned and operated by the Chittenden County Solar Partners, LLC. The value of the electricity generated by the farm has been tagged at \$924,000 a year and is enough to power more than 400 homes.

While most of the installation was accomplished using cut and cover, the HDPE conduit also provided the solution to go under a heavily forested section of private property and a section of wetland.

"We directionally drilled two, 400-foot runs of five-inch diameter HDPE pipe used for the main power feed and communication cables," explained Aaryn French, project manager for Engineers Construction, Inc. (Williston, VT).

French agreed having CIC was a benefit. It took his four-person crew just a month to install all the low and medium voltage conduit at an average depth of three feet. "The trenching, which was the majority of the work, went very smoothly as well. It was nice because we'd just start pulling the wire out and leave the proper length at the end and just lay it right in the ground. This was more efficient than using sticks of PVC - probably five to ten times faster.

"And because we had the cable already in the conduit, it saved us a lot of time. We were killing two birds with one stone. Installing the pipe and wire at the same time -- that was a huge benefit.

"This is probably one of the biggest applications of using it this specific manner. In this application it was cost efficient, its time efficient and it just worked really well." French continued. "That's because we weren't trying to put together PVC, and putting a pull string in and pulling the wire...this was one shot deal...you complete the trenching, you know your two end locations, tie it in, backfill and you're done."

"We're seeing more and more power and fiber optic cables being put underground," Radoszewski said. "This is especially true of new housing and building construction. CIC is also very popular for installing FAA lighting for airport applications. Plus, there is a strong move today for communities to take existing overhead lines and bury them to eliminate 'wire blight' and provide safer and more secure power and telecom systems, which are also protected from severe weather."

For more information, go to: [www.plasticpipe.org](http://www.plasticpipe.org).

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### **About PPI:**

The Plastics Pipe Institute Inc. (PPI) is the major trade association representing all segments of the plastic pipe industry and is dedicated to promoting plastics as the material of choice for pipe applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in development and design of plastic pipe systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation method.