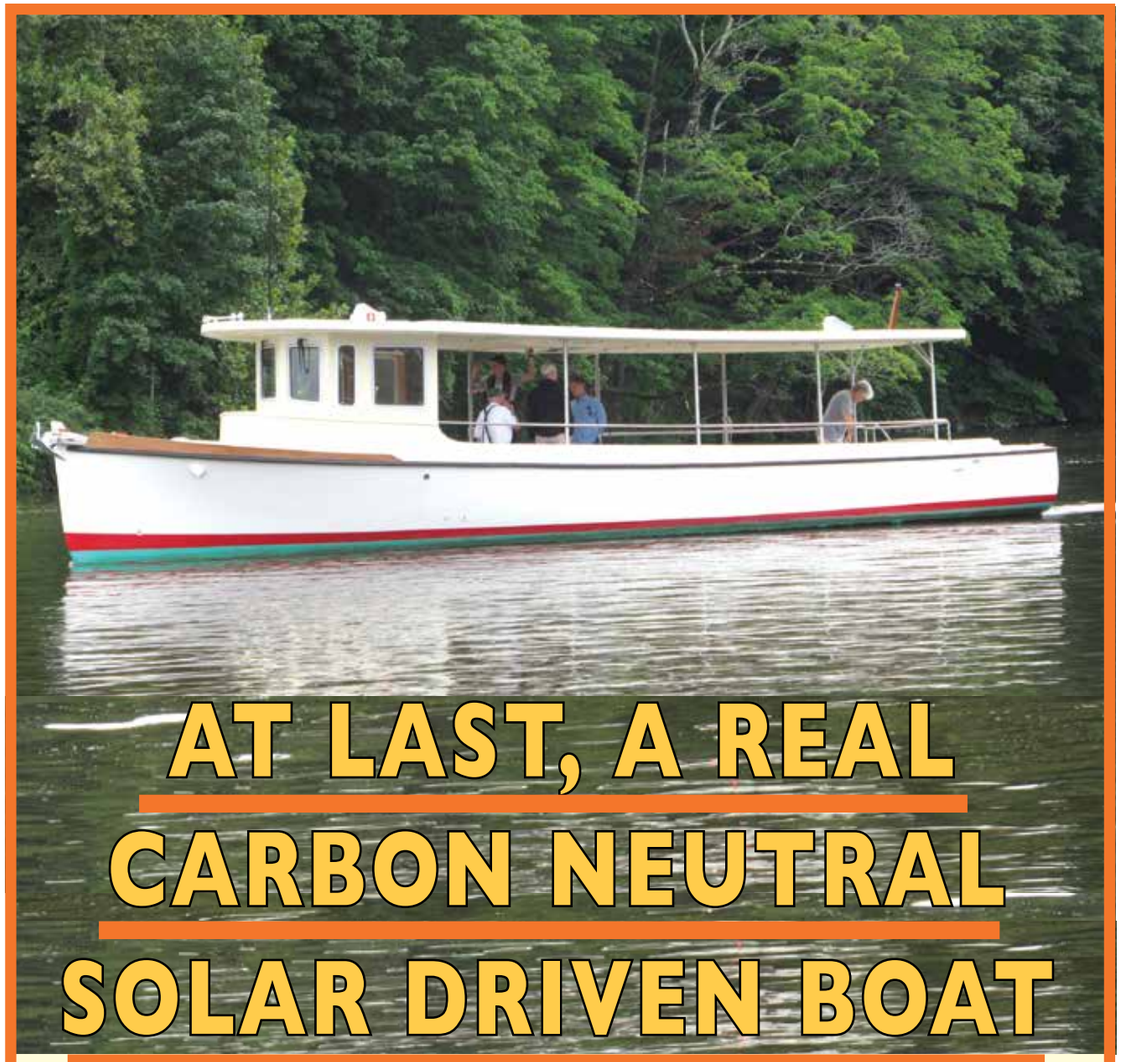


AT LAST, A REAL CARBON NEUTRAL SOLAR DRIVEN BOAT

Imagine an all-electric boat so clean, quiet and efficient that at times there is more electricity available at the end of the trip than when the boat started out.

The concept, devised by David Borton, is that a solar boat with an exceptionally efficient hull and with a solar roof of high efficiency solar panels can propel the hull if modern electronics are also used. The controller between the solar panels and the battery storage makes the most of available sunlight. The motor controller makes the most of the available sunlight by running a 3 phase underwater electric motor. To make this a reality and to meet Coast Guard regulations for passenger boats, Dave Gerr, a New York City Marine Architect, engineered David Borton's recently patented designs into a Coast Guard approved detailed design. The result is Solaris, built at the Hudson River Maritime Museum's Wooden Boat School in Kingston, NY. She is perhaps the most environmentally friendly vessel on the water and the first continuously and exclusively solar-powered commercial tour boat inspected and certified by the US Coast Guard.

Solaris has 5.8 kW of solar panels on the roof that provide unlimited range when the sun is shining, and 90 kWh of battery power for when it's not. The motor is a Torqeedo 10 kW. (Electric motors deliver more practical power than gasoline, so a "smaller" electric motor can push a boat more effectively than a similar sized gasoline outboard.) Optimal cruising speed is about 6 knots, ideal for a tour boat, and the ride is very quiet: there is no shouting over engine noise to have a conversation, and a speaker talking at normal volume can be heard by the group. With no vibration, pollution, exhaust or odors, marine wildlife is not disturbed and the water is not sullied. The very efficient hull results in less wake under power. There is no engine oil or fuel, and maintenance and operating costs are minimal.

Owned and operated by the Hudson River Maritime Museum, Solaris began taking passengers in May 2019, demonstrating what can be done without fossil fuels. Solaris accommodates 2 crew and up to 24 passengers and runs entirely on her onboard solar panels - no shore power or generator needed. She has traveled the Hudson River north to the Erie Canal and south to New York City. Just riding in Solaris is an educational experience. "I didn't know you could do this" is a typical comment to a Solaris Captain. With her classic design, Solaris is beautiful to look at and beneficial for water quality and marine life, as well as for human health and enjoyment.

Solaris will be taking reservations, for any and all who are interested in a one of a kind, carbon-neutral boat ride. Many cruise possibilities exist, from a variety of 1 to 2 hour tours (price range $20-$35) to private charters. Capacity will be adjusted according to current Covid guidelines. The required safety talk to passengers at the start of a commercial trip makes explicit the benefits of the design and construction, and every excursion on Solaris includes a preamble that outlines the environmental benefit of the vessel including references to climate change and other specific examples. For details and online reservations, see https://www.hrmm.org/all-boat-tours.html or call the Hudson River Maritime Museum at 845 338-0071.

The designed efficiencies allows Borton's "Solar Sal" line of boats to be practical using solar-only electricity. The previous versions, 25 and 40 foot wooden boats, proved the design concepts, culminating in the 44-foot Solaris. All Solar Sal Boats have sufficient electricity stored in batteries to travel 50 miles at night and no requirement to plug-in to the electrical grid to recharge. The goal now is to make 100% solar-electric boats more widely available, which means making them more affordable.

"A new addition to the Solar Sal line of boats, the 24' fiberglass model (design details by JF Bedard), is expected by late summer"

The Solar Sal Boats division of Sustainable Energy Systems, Inc. is now actively taking steps to build future boats with fiberglass instead of wood. Once molds are made, fiberglass boats can be made more quickly and less expensively. Solar Sal Boats will soon be introducing a new model: the 24-foot, mass-producible, fiberglass version is now beginning construction and is expected to be ready by late summer.

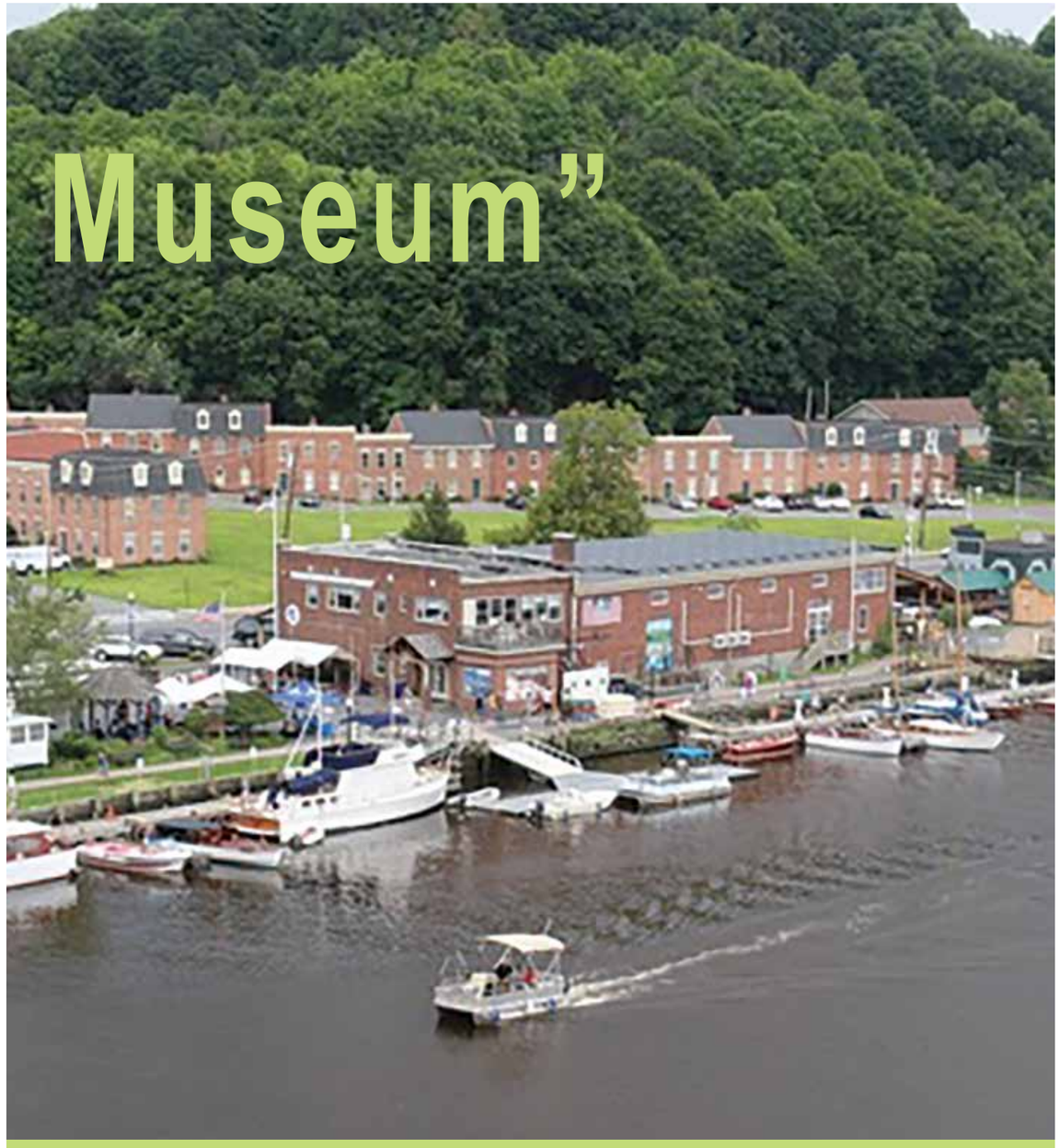
"The Green Museum"

by **Sarah Wassberg Johnson and Jack Weeks**

***F**ounded in 1979, the Hudson River Maritime Museum in Kingston has been a fixture of the Rondout waterfront for over 40 years. Interpreting the history of the navigable length of the Hudson River and its tributaries, the Hudson River Maritime Museum has long realized the historical impact of the valley's industrial past on the natural landscape. As a waterfront museum that has endured numerous floods, especially during Hurricanes Irene and Sandy, we are also cognizant of the threats of climate change. Because of this, the museum has developed the concept of "The Green Museum," a long-term goal to move the museum toward carbon neutrality. Work towards this goal has already included the installation of solar panels, heat pumps, and an HVAC system in the museum's primary building.*

In addition to green facilities upgrades, the museum is incorporating climate change information into its exhibits and interpretation. Funded by a Hudson River Estuary grant from the NYS DEC, a new exhibit on climate change is currently under construction at the museum. A semi-permanent, hands-on display inside the building will be accompanied by outdoor interpretation. The exhibits will connect the industrial activities of the past with today's climate issues, as well as provide information on possible solutions.

In the last fifteen years, the museum has transformed from a small, local museum to a regional maritime heritage center. With its deep water bulkhead and no height restrictions, the museum's transient docking has been a cornerstone of the museum's growth. HRMM has become a destination for boaters from around the world. Our new Boater's Welcome Center, part of the Wooden Boat School, features showers, toilet facilities, and other services for our overnight guests.



Home Port for the *Clearwater*

***In 2012** the museum partnered with the Hudson River Sloop *Clearwater* to construct the Kingston Home Port & Education Center. Constructed to withstand the effects of flooding, this post-and-beam barn-like building is built on 80 foot pilings, with a three-foot concrete knee wall and elevated outlets. Built using historic techniques with post-and-beam joints and over 1,000 wooden pegs, the Home Port can easily withstand flooding without serious structural damage. Clearwater docks at the museum during the winter and uses the space for sloop maintenance. In the summer, the museum uses the Home Port as a multi-use event space for educational programs, community events, and event rentals, including weddings.*

In 2015, thanks to generous individual support as well as a grant from Scenic Hudson, the museum purchased the former Rosita' restaurant and transformed it into a Wooden Boat School. The

boatbuilding, as well as opportunities for boat restoration. Flexible program space in the classroom portion of the school is used for everything from instruction to lectures to special events.

In 2018, the museum opened the Sailing & Rowing School, purchasing a fleet of small sailboats and keelboats to teach youth and adults the joys of sailing and rowing on the Hudson River. The goal with these schools is to keep the traditional knowledge of maritime skills alive. Wooden boatbuilding was a huge industry in the port of Rondout and other Hudson River port cities throughout the 19th century. From the earliest Dutch sloops crewed by Dutch colonists and enslaved Africans, sailing has been an integral part of the Hudson River's history, aided by its tidal nature. The Hudson River Maritime Museum is committed to providing education and access to everyone to ensure these important skills are not lost to history.

In 2016 the museum was approached by David Borton to build a solar-powered tour boat. Built by the Hudson River Maritime Museum's boat restoration arm, the construction took two years. The end result was a 44' 100% solar-powered passenger vessel that the Hudson River Maritime Museum realized would be perfect to use as a floating classroom and provide regular and reliable access to the Rondout Lighthouse. With financial support from Sustainable Energy Systems, the New York State Department of Environmental Conservation, Scenic Hudson, and individual donors, the museum was able to purchase the vessel. Thanks to input from a public naming contest, we decided "Solaris" was perfect.

But the work wasn't over yet. A completely new vessel design, Solaris underwent rigorous testing by the U.S. Coast Guard to ensure that she met the safety requirements for commercial passenger-carrying vessels. In the fall of 2018, Solaris passed her speed/range endurance test using only reserve battery power. She can travel up to 50 miles at night on battery power alone. In the spring of 2019, Solaris passed her final inspection and started carrying paying passengers that summer.

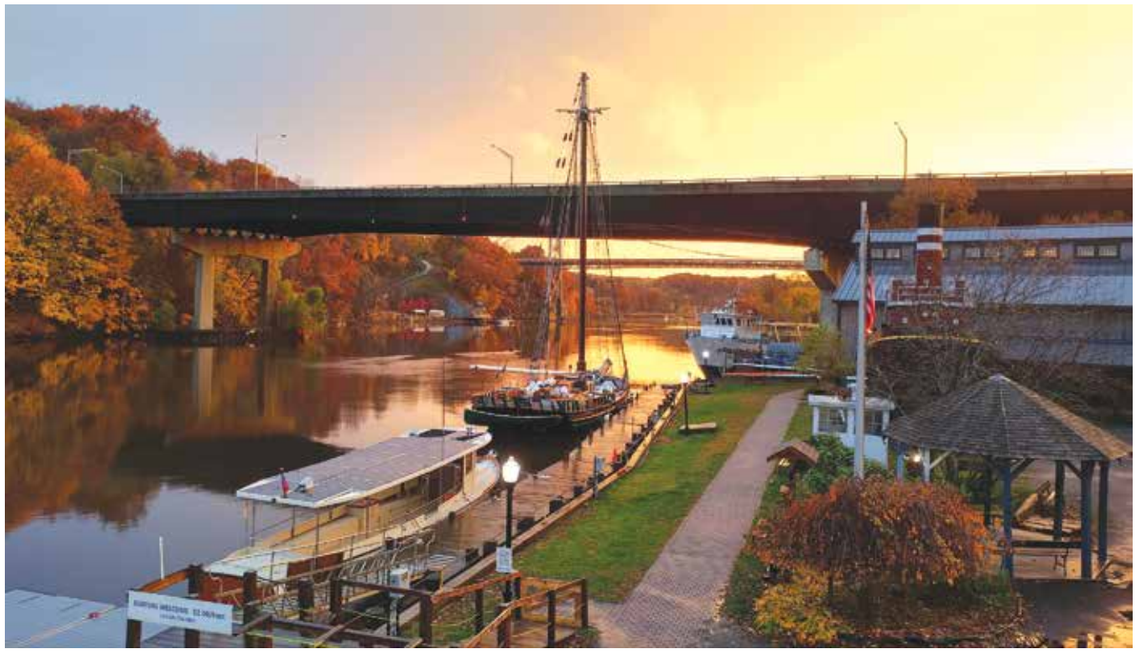
Solaris provides a unique experience for passengers. Nearly silent, throwing almost no wake, and without the vibration, noise, and exhaust, Solaris is ideal for educational programs, conversations, and getting up-close and personal with wildlife and historic landmarks. Captain John Phelan remarks, "We have to be careful about sneaking up on kayakers. They often don't hear us approaching."

Solaris is also an ideal tour boat for other reasons. Her electric motor requires no fuel or oil changes. The solar panels are always "on," and even on cloudy days can collect enough energy that operation does not use battery power. So efficient are her systems, that Solaris never has to plug into the electrical grid. In fact, the opposite is true – in 2020 adapters were installed to allow the charging of phones and laptops from her solar panels.

Since the summer of 2019, Solaris has been providing the public with educational tours of the Rondout Lighthouse, Esopus Meadows Lighthouse, Rondout's industrial waterfront, the ecology of the Hudson River, and more. With new programs added each year, historical education programs aboard Solaris extend the informal "classroom" of museum exhibits. To find out more about all the options available on Solaris, visit the museum's website hrmm.org.

As the museum plans its 2021 season, we invite you to visit us and the river - online or in person - to learn more about the Hudson River, its history, and its green future. By planning for the future, the museum can help ensure that access to the Hudson River and its history can be enjoyed by everyone for generations to come.

Sarah Wassberg Johnson is the Director of Exhibits and Outreach.
Jack Weeks is HRMM Board President and a *Solaris* Captain.



Call 845-338-0071 To Enjoy Your Carbon Neutral Boat Ride

A REAL CARBON NEUTRAL SOLAR DRIVEN BOAT

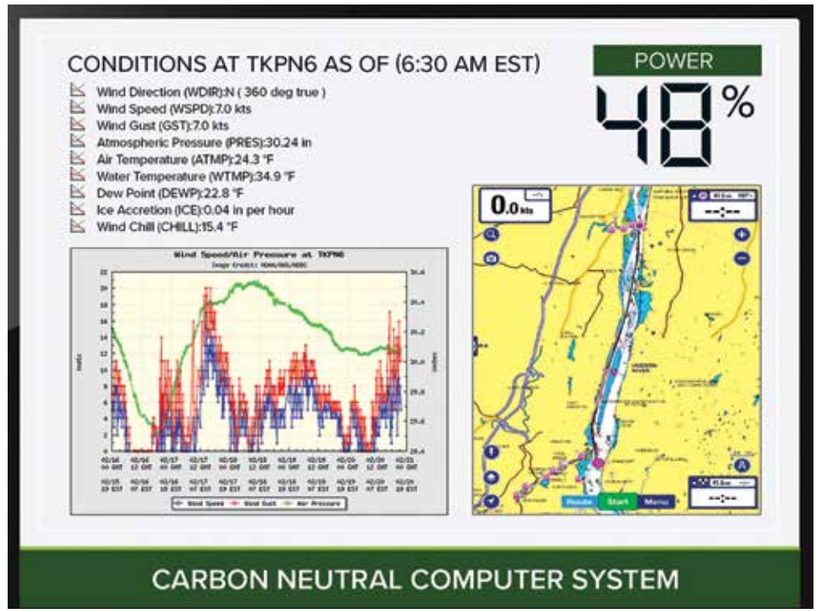
by John H. Vargo, Publisher

Imagine an all-electric boat so clean, quiet and efficient that at times there is more electricity available at the end of the trip than when the boat started out. Impossible, well read on...you start with a patented, award winning, U. S. Coast Guard approved, passenger carrying 100% self sustaining solar driven boat, that in its own right, is truly spectacular in operation. Then, incorporate a complete, carbon neutral computer system and, "wahla", you have something very, very special.

Located at the Hudson River Maritime Museum on Rondout Creek in Kingston, NY this boat will be taking reservations, for any, and all that are interested in a one of a kind, Carbon Neutral boat ride.

The trips are $35.00 per person, and, depending on conditions, will usually last two hours. What makes this so interesting is that the boats main display, located up front with the captain, provides and ongoing report of the power left in the batteries at all times as well as other information affecting the boat.

Most importantly, the system is continuously capturing data on relevant conditions that this boat is about to travel in. Wind direction, wind speed, wind gusts, atmospheric pressure, water temperature, tide, current, passenger load, route that is planned, power left in the batteries is all displayed on the multi functioning screen. The Captain, trained to read this series of screens, can very easily decide the best, most efficient trip possible based on the information provided.



An example of this:

It is two o'clock in the afternoon, tide is half down, running at 2 knots. The winds are from the north at 18 miles per hour. The captain, reading these conditions, decides that if he travels south, keeping to the west shore, his passengers will have a very quiet, smooth ride. He knows that with wind and tide going the same way, he will fly down the river at over 8 miles per hour. This will take his boat past the Esopus Lighthouse flats, probably reaching Black Creek on the west shore, opposite Norrie Point State Park on the opposite shore.

The wind and tide going the same way creates a force on the river that moves the water much faster during this time period. The usual six hour time period that it takes to reach low tide and it swinging around, will be shortened significantly! (By the time the boat, named *Solaris*, reaches this point to return home, the tide will have turned and be coming in or moving northward). Solaris with its solar panels on the roof, are producing power equal to or better than what is being used on a sunny day! If it is at night, or completely clouded over, the batteries still have enough power to run for over 50 miles.

The captain is constantly watching the display in front of him, and this allows him to make decisions as to the most efficient route to return back to his home base at the Hudson River Maritime Museum

He decides that with the tide now "turned" and moving northward, his best route is the same as when he came down. While the tide and current are pushing him back north, it is out of the still blowing 18 mile wind coming down river in other words he can now decide, based on the data being provided, by the Carbon Neutral Computer System display his most efficient route and still very interesting trip back for his passengers.

As *Solaris* pulls into its home base, everyone on board can see that *Solaris* did not only make a totally efficient carbon free trip but still only used ten percent of its power to make the trip.

Please note, the Hudson River conditions are never, ever, the same two days in a row. There is always variables. That is what makes this Carbon Neutral Computer System so important to the efficiencies it provides!

To make your reservation call the Hudson River Maritime Museum at 845-338-0071 Boat trips are planned on a full capacity basis. Each passenger will be contacted to confirm the departure date of their trip.