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Hybrid Power—First by Land and Now by Sea

Our cars are slowly morphing from vehicles with fossil fuel-powered engines into ones with hybrid and electric power systems. The price of a gallon of gasoline is making members of the general public cringe each time they pull into a gas station for a fill up. To answer the public outcry for relief from astronomical gasoline prices, car manufacturers are starting to produce hybrid vehicles that raise the bar on gasoline efficiency.

If you think the price for fuel is high at your local gasoline station, Google gasoline and diesel fuel prices at docks and marinas. I have no doubt that eventually all transportation vehicles will be weaned off of fossil fuels.

The *NY Hornblower* is the first not-classified vessel to spin its propellers and power its electrical systems using a hybrid system that combines hydrogen fuel cells, solar panels, and wind turbines. When this column went to press, the *NY Hornblower* was still in its construction dry-dock almost ready for its New York City debut. When it goes into service, perhaps this month, it will transport passengers to the Statue of Liberty and the Ellis Island immigration museum from Manhattan's pier 40. The illustration at right shows an artist's rendering of what the vessel will look like. (Until this ship is removed from dry dock and in open water it can't be photographed.)

Since ships are much larger than cars, their hybrid technology doesn't have to be shoehorned into a limited space. The diagram on page 11 shows the location of the ship's wind turbines, solar panels, fuel cells, propulsion batteries, and also its diesel engines. The diagram indicates that all the power systems, including the diesel engines, are used to generate or store electricity. The propellers on the *NY Hornblower* are turned by electric motors just like the wheels of a hybrid car.

NY Hornblower

Artist's rendering of the hybrid *NY Hornblower*

To combine the power from so many different power systems, the *NY Hornblower* has a specially designed control system that its captain will employ to determine which power source to use at any given moment. The most significant difference between auto hybrid technology and this ship's hybrid technology is how the hybrid systems are controlled. The computer on a hybrid car automatically determines the best power mode. On the *NY Hornblower*, the captain is empowered to make that determination.

Energy from wind and sun are, for the most part, to be channeled into running the ship's navigation systems, monitors, and lights. The energy from the hydrogen fuel cells and the diesel engines, for the most part, will generate electricity to charge the 192 batteries that will power the electric motors that turn the ship's propellers. However, the different power systems on this ship are not locked into these specific tasks because a dc bus shown in the center of the diagram allows the electricity that is generated by any system to be transferred to all parts of the vessel.

While researching this column, I formulated a number of questions about how the systems of the *NY Hornblower* would operate. These questions were answered by Cameron Clark, director of environmental affairs for Alcatraz Cruises, and the *NY Hornblower* project director. Clark's engineering team designed and built the ship's hybrid drive. When I asked what percentage of power will come from diesel engines versus from the green energy systems, I was surprised to learn that they didn't know. Clark indicated that "the vessel must be in service for these numbers to be determined."

Rapid cold ironing is the nautical name given to getting electric power from land when a vessel is docked. When this column went to press, Clark indicated that the rapid cold

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More Than Fun Answers

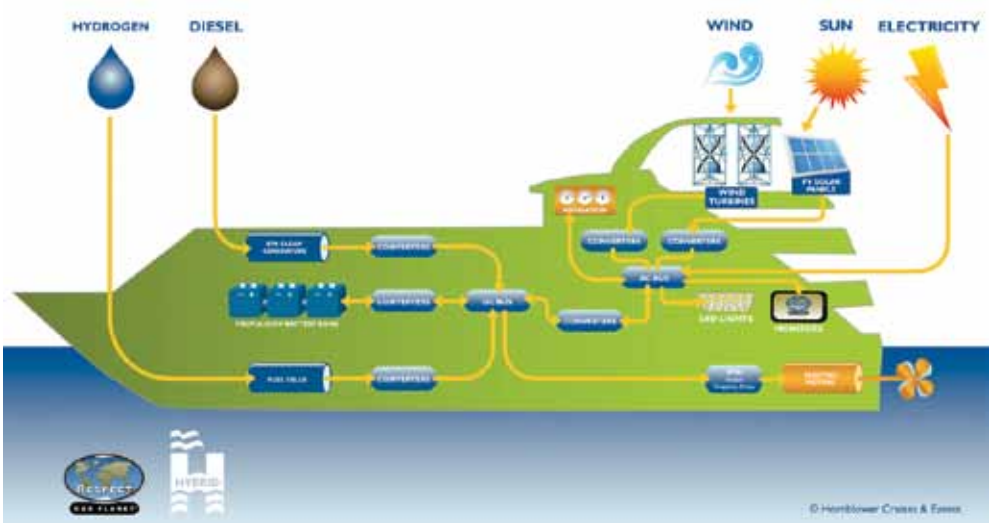
Leverage

A. Paper cutter–2; B. Compass–3;
C. Claw hammer–l ; D. Wheelbarrow–2;
E. Cable cutter–l; F. Ice tongs–3;
G. Nutcracker–2; H. Lazy tongs–1;
I. Pantograph–3; J. Bellows–2;
K. Balance–l; L. Vise–3

Location, Location

7 + 65 – 43 + 21 = 50
12 + 3 – 45 = –30
23 + 45 – 67 = 1

ironing process was still under development. The "Hornblower does not have rapid in the cold ironing yet, and we are currently working on it. It will connect [when the *NY Hornblower* system is completed] to shore power when the vessel is docked for the evening, but probably not when the vessel is embarking or disembarking passengers." When rapid cold ironing goes into service on the *NY Hornblower*, the vessel will not only be a hybrid somewhat similar to a Toyota Prius, it will also be a plug-in hybrid vehicle somewhat similar to a Chevy Volt.



The *NY Hornblower* connects power sourced from the wind, the sun, the electrical grid, traditional fuels, and hydrogen.

Recycling played a significant role in the development of this vessel. Could you expect less from a project director with the title Director of Environmental Affairs? Where ever possible, recycled materials were used to build, or should I say rebuild, this ship. "The vessel is a rebuild of an oceangoing casino from Florida, which was built in the U.S. in 1996," says Clark. "It was originally 139' long and 40' wide, and was lengthened to 168'. Deconstruction began in 2009 when the vessel was purchased."

Recalling the Facts

1. In what way is the *NY Hornblower* similar to a Toyota Prius and a Chevy Volt?
2. What is rapid cold ironing and how will it power this ship?