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Solar-Electric Pump-out Boat Technology: Impacts on the Marine Environment, Public Health, and Climate Change

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Abstract : The popularity of recreational boating is on the rise in the United States, which raises numerous national-level challenges in the management of air and water pollution, aquatic habitat destruction, and waterway access. The need to control sewage discharge from recreational vessels underlies all of these challenges. The release of raw human waste into aquatic environments can lead to eutrophication and algal blooms; can increase human exposure to pathogenic viruses, bacteria, and parasites; can financially impact commercial shellfish harvest/fisheries and marine bathing areas; and can negatively affect access to recreational and/or commercial waterways to the detriment of local economies. Because of the damage that unregulated sewage discharge can do to environments and human health/marine life, recreational vessels in the United States are required by law to 'pump-out' sewage from their holding tanks into sewage treatment systems in all designated 'no discharge areas'. Many pump-out boats, which transfer waste out of recreational vessels, are operated and maintained using funds allocated through the Federal Clean Vessel Act (CVA). The East Shore District Health Department of Branford, Connecticut is protecting this estuary by pioneering the design and construction of the first-in-the-nation zero-emissions, the solar-electric pump-out boat of its size to replace one of its older traditional gasoline-powered models through a Connecticut Department of Energy and Environmental Protection CVA Grant. This study, conducted in collaboration with the East Shore District Health Department, the Connecticut Department of Energy and Environmental Protection, States Organization for Boating Access and Connecticut's CVA program coordinators, had two aims: (1) To perform a national assessment of pump-out boat programs, supplemented by a limited international assessment, to establish best pump-out boat practices (regardless of how the boat is powered); and (2) to estimate the cost, greenhouse gas emissions, and environmental and public health impacts of solar-electric versus traditional gasoline-powered pump-out boats. A national survey was conducted of all CVA-funded pump-out program managers and selected pump-out boat operators to gauge best practices; costs associated with gasoline-powered pump-out boat operation and management; and the regional, cultural, and policy-related issues that might arise from the adoption of solar-electric pump-out boat technology. We also conducted life-cycle analyses of gasoline-powered and solar-electric pump-out boats to compare their greenhouse gas emissions; production of air, soil and water pollution; and impacts on human health. This work comprises the most comprehensive study into pump-out boating practices in the United States to date, in which information obtained at local, state, national, and international levels is synthesized. This study aims to enable CVA programs to make informed recommendations for sustainable pump-out boating practices and identifies the challenges and opportunities that remain for the wide adoption of solar-electric pump-out boat technology.

Keywords : pump-out boat, marine water, solar-electric, zero emissions
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