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Interactive comment on "Exploitation of the far-offshore wind energy resource by fleets of energy ships. Part A. Energy ship design and performance" *by* Aurélien Babarit et al.

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As handling Associate Editor for this paper, I am posting an additional review that I received by email. Best regards Carlo L. Bottasso

The Farwind concept is an interesting, multidisciplinary one that proposes to produce fuel in the open ocean. The ship uses Flettner rotors to produce the propulsive force to move the ship and underwater turbines to generate electricity which is then used on-board to produce hydrogen and then methanol. The methanol use CO2 as a feedstock, but that is produced elsewhere and brought on-board separately. The Farwinder is one a set of generally similar concepts in which a fuel is made on an unmoored ship. In

other variants the ship may be propelled by wingsails or wind turbine thrust; electricity may be made by a wind turbine on the ship, and the fuel produced could be simply hydrogen itself or ammonia. The Farwinder is unique in that it proposes to use Flettner rotors and produce methanol. The proposal at this stage is still quite conceptual. Each of the steps will need validation, as will the performance of a complete system. The paper would benefit from discussion of a few points in more detail. The authors indicate that the sideways force on the hull is insignificant and implicitly would result in little power loss due to motion in the sideways direction. Further justification is needed of that. There has been other work considering the use of wind turbines, wingsails or Flettner rotors for saving fuel on cargo vessels. Those concepts are somewhat different in that the purpose of the turbines or rotors is to augment propulsion on vessels of relatively high drag rather than to produce fuel, but there is enough similarity that it would be worth discussing them. Examples of such work are Wind Turbine Propulsion of Ships by Bøckmann and Steen (2011) and Drift Forces – Wingsails vs Flettner Rotors by Kramer, Steen and Savio (2016). The question of the similarity and differences between the Farwinder means of wind energy extraction and a conventional wind turbine is an interesting one and merits some discussion. It could be argued, in fact, that the concept is actually a variant of the Madaras rotor power plant of the 1930s. In that plant, Flettner rotors also provided the propulsion and the electricity was generated at the level of the platform through the motion created by the force from the rotors. See, for example, Analysis of the Madaras Rotor Power Plant: an alternate method for extracting large amounts of power from the wind, by Whitford et al. (1978). Some additional suggestions to consider are the following p.2, line 32: The wind resource is strongest in the "open ocean" instead of "at sea", otherwise the advantage of FARWINDers operating in a stronger wind resource far-offshore is not evident. p. 2, line 40: "not neither" should be corrected to "neither" p. 4, line 86: At what scale are these CO2 methods feasible? p. 4, line 86: "indirectty" should be corrected to "indirectly" p. 4, line 92: "remaining" should be "remainder" p. 4, line 100: Figure 2 indicates that the Flettner rotor is providing energy (from the wind, which ideally should be shown as

coming from the side) to the FARWINDer; the arrow should be pointed in the direction of the FARWINDer motion. There is external energy source responsible for the rotation of the rotors; that should also be included in the figure. p. 6, line 131: It is not clear in what plane As lies. It is also referred to as the "sail" area, and referred to as the "rotor" elsewhere in the paper. p. 6, line 138 "propeller of the turbine" is a misnomer; a propeller induces a greater velocity at the rotor plane and the turbine induces a lesser velocity; it is the water turbine's rotor that is being referred to p. 6, line 139: "according to the" should be corrected to "according to" p. 6, line 143 It would be helpful to provide a background and a figure to aid in clarifying the rotor disk area and momentum theory to the reader. p. 6, line 150: It is unclear under what conditions the form factor k is neglected p. 7, line 153: What range of the Reynolds number does this formula account for and what is an approximate Reynolds number for the FARWINDer? p. 7, line 163: There is no need to introduce a new variable Pp since it is equal to PT. p. 7, line 167: The optimal axial induction factor 0.04 is dependent on the configuration of ship, turbine, and other parameters not fully explicated. It can vary depending on the hydro turbine, hull, and Flettner rotor configurations. p. 9, line 210: "Manoevring" should be spelled "maneuvering"

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