December 23, 2022

This December 2022 NYC Department of Transportation (DOT) addendum to the Ferry Fuel and Propulsion Feasibility Study (the "Report" and/or "2019 Report") prepared by Glosten, Inc. includes an update on the Staten Island Ferry fleet, regulatory changes, and the implementation of the Report's recommendations since its original release in 2019. The Report was completed pursuant to NYC Administrative Code 19-307(k).

A. Fleet Configuration

The following is an update of the NYC Department of Transportation (DOT) Staten Island Ferry (SIF) fleet configuration since the 2019 Report:

- Two of three Ollis-class ferries have been delivered, accepted, and placed into operation by SIF. Ferry Boat (F/B) SSG Michael H. Ollis and F/B Sandy Ground are currently in operation. F/B Dorothy Day has yet to be accepted by SIF. Acceptance is expected shortly, and it is anticipated that F/B Dorothy Day will be in passenger service in the first quarter of 2023.

- F/B John F. Kennedy has been removed from service and sold at auction by the NYC Department Citywide Administrative Services (DCAS).

- F/B Barberi is planned to be removed from service once F/B Dorothy Day is in service and operational. At that point, the Barberi will be removed from the fleet and turned over to DCAS for its final disposition. Once that occurs, the final fleet make-up will be:
    - F/B SSG Michael H. Ollis
    - F/B Sandy Ground
    - F/B Dorothy Day
    - F/B Guy V. Molinari
    - F/B John J. Marchi
    - F/B Spirit of America
    - F/B Samuel I. Newhouse
    - F/B Alice Austen
    - F/B John Noble

B. Regulatory Changes

There have been no significant changes in regulations since the 2019 Report. For its carbon emissions reduction target, the Report used New York City's goal of 80 percent reduction in greenhouse gas (GHG) emissions by 2050, including an interim target of 40 percent reduction by 2030, as laid out in OneNYC's New York City's Roadmap to 80 x 50. Since the 2019 Report, OneNYC2050 has further committed New York City to

achieving carbon neutrality by 2050 while targeting to deliver the best air quality among major U.S. cities by 2030. In addition, the Federal Transit Administration (FTA) launched the Sustainable Transit for a Healthy Planet Challenge to encourage transit agencies to build on progress already made to further reduce GHG emissions from public transportation. These reductions support President Biden's GHG goal to achieve a 50-52 percent reduction from 2005 levels in economy-wide net GHG pollution by 2030.

C. Report Recommendations

Update: Immediate Recommendations

SIF: Use hydrotreated renewable diesel fuel in all vessels

Recommendation: The 2019 Report stated that Hydrotreated Renewable Diesel (HRD) is the best immediate option to reduce each ferry fleet's global warming potential by one third. The refining process used to produce HRD results in a fuel that is chemically like petroleum diesel while eliminating the risks associated with biodiesel. The 2019 Report recommended a 50 percent blend of HRD with petroleum diesel, but an increased amount of HRD may be possible.

Status: DOT has been discussing future opportunities for HRD with our sister agencies, including a potential bid specification for a Citywide HRD requirements contract. SIF has begun pre-planning for a small pilot project to use HRD when the requirements contract has been finalized. This pilot would be used to determine if the use of HRD has any adverse impacts on ferry operation and maintenance. After receiving data from the pilot, DOT will perform a cost analysis associated with switching the fleet to HRD.

SIF: Apply low-friction hull coatings to SIF vessels at the next scheduled drydocking

Recommendation: The Report recommends the use of low-friction hull coating systems on SIF vessels with advanced coatings applied during the ferries' next regularly scheduled drydocking period. The Report indicates that low friction coating systems carry a small increase in lifetime maintenance costs that is repaid 20 times over by decreased fuel consumption.

Status: SIF has investigated the use of low friction hull coatings. However, it was determined that due to the nature of these coatings, mechanical damage to the coatings is difficult and expensive to repair. Due to the outstanding maintenance concern, SIF has decided to hold on any consideration of a complete paint system change until a full system renewal becomes necessary. This will be re-evaluated at that time.

SIF: Modify Molinari-class fwd/aft power distribution to improve propulsion efficiency

Recommendation: The Report indicates that adjustment of the power distribution between the forward and aft end propellers on the Molinari-class ferries is an easy way to reduce fuel consumption on those vessels. This has already been trialed on F/B Marchi and was found to offer up to a 15 percent fuel savings.

Status: Changes to the power distribution were incorporated into the Molinari-class drive systems at the time of their replacement. SIF is still planning for further optimization opportunities in the future.

SIF: Install fuel flow meters on one Molinari-class vessel and one VSP vessel to monitor real-time fuel consumption and improve operations

Recommendation: The Report recommended the installation of flow meters on both the supply and return piping at the main engines as a simple and cost-effective way to better inform operators how their handling of a vessel affects fuel consumption.

Status: SIF has procured the equipment necessary for this upgrade. Installation of the new meters is being scheduled and will be performed during a vessel drydock period.

Update: Short-Term Recommendations

SIF: Upgrade Barberi and Molinari-class propulsion engines to improve EPA tier ratings

Recommendation: The Report recommends that further emissions upgrades to the existing propulsion engines on both Barberi and Molinari-class ferries would reduce particulate emissions up to 40 percent and NOx by 3 percent. The Report indicates that these upgrades could qualify for Volkswagen NOx abatement funding. The Governor's strategy document for using the abatement funds noted a need to identify appropriate ferry projects.

Status: SIF decided to pursue EPA Tier 3 emissions upgrades on the Molinari-class ferries and completed the upgrade for F/B Marchi in October 2022 with upgrades to F/B Molinari and F/B Spirit of America slated for 2023. SIF has decided not to pursue these upgrades on F/B Newhouse. Only an upgrade to Tier 3 is being pursued because a Tier 4 upgrade requires significant, costly, and more involved modification work. SIF is also planning to replace the existing Molinari-class Tier 0 Ship's Service Diesel Generator engines to a Tier 3 model. The engines have been ordered and will be delivered in Summer 2023. Replacement work will commence in 2023, and work on each vessel will be phased according to available shipyard periods. The procurement of these engines

was funded through the New York State Volkswagen Beneficiary Mitigation Plan for NOx abatement.

SIF: Investigate hybrid technology strategies for Molinari-class vessels

Recommendation: The Report indicates that the load profile and power train architecture of Molinari-class vessels make them possible candidates for a series diesel-battery hybrid conversion. Using batteries to absorb excess power during maneuvering and passenger loading could allow for lower power plant output during transit. This has the potential to put onboard combustion engines at a more efficient and cleaner load point through the vessel's operating profile.

Action: SIF has begun implementing a hybrid conversion for Molinari-class ferries. A task order for the design of the conversion has been prepared and is currently in the registration process. In addition, DOT has secured additional FTA funding for batteries that would be used as part of this conversion.

Update: Long-Term Recommendations

SIF: Investigate propulsion optimization options for Barberi, Austen, and Ollis-class ferries

Recommendation: The Report recommends that an investigation be performed regarding the optimization of the Barberi, Austen, and Ollis-class vessels, all of which use Voith-Schneider propellers.

Status: This optimization differs from that of the Molinari-class due to the nature of the propulsion system. No action has been taken regarding this recommendation because such optimization would likely be more difficult than that of the Molinari-class.

Update: Future Fleet Recommendations

SIF: Invest in plug-in electric infrastructure to leverage green grid technologies

Recommendation: The Report suggests that the blueprint for an environmentally-friendly ferry fleet is electrification. Electrification would allow the ferry systems to leverage incremental improvements in land-based green power generation where the dramatically larger market provides greater incentive for advanced research. The path to large-scale emissions reduction begins with embracing electric propulsion.

Status: DOT has secured funding from NYC Office of Management and Budget for a Preliminary Design Investigation (PDI) to advance this recommendation. The results of the PDI identify how to achieve a 50 percent reduction in GHG emissions by 2030 and carbon neutrality by 2050. The investigation will also identify a preliminary design of a

new ferry class expected to replace the Austen-class ferries and F/B Newhouse, the last remaining Barberi-class ferry. SIF is currently developing the scope of work and procurement documents.